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THE BREATH OF LIFE*

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THE text of my address this evening will be found in Holy Writ in the second chapter of Genesis and the seventh verse, where it saith—"And the Lord God formed man of the dust of the ground and breathed into his nostrils the breath of life; and man became a living soul". But in Flavius Josephus we read in the second paragraph of the first book that "God took dust from the ground and formed man and inserted in him a spirit and a soul". So here we see that there is apparently a close affinity between life, the spirit and soul. Already we find in the first chapter of Genesis that God had commanded the waters to bring forth abundantly every moving creature that hath life and fowl that may fly above the earth in the open firmament of heaven. And He created great whales, and every living creature that moveth and let the earth bring forth the living creatures and made the beast of the earth after his kind, and cattle after their kind and everything that creepeth upon the earth after his kind: He commanded them to reproduce each after their kind. So having provided for the future of man "He breathed into him the breath of life" and made him a living soul.

This beautifully allegorical account of the Creation cannot but move us to admiration of the perfect historian who in a few clear-cut sentences outlines his conception of the beginning and way of life. But it must be noted that to man only was there given something of a special nature—all animal life was commanded to live, to reproduce, but *the breath of life gave to man a soul.*

A somewhat more comprehensive interpretation of the breath of life is undoubtedly to be found in ancient writings, but, to keep to Holy Writ, we find written in the fifth chapter of II Kings and the 34th and 35th verses how Elisha resuscitated the son of the Shunammite:

> "He went up, and lay upon the child, and *put his mouth* upon his mouth and his eyes upon his eyes, and his hands upon his hands: and he stretched himself upon the child; and the flesh of the child waxed warm.
>
> "Then he returned, and walked to and fro: and went up, and stretched himself upon him, and the child sneezed seven times, and the child opened his eyes".

This is the first recorded resuscitation by direct artificial respiration: the transference of the breath of life or the spirit of the soul of man from the holy prophet to the son of the Shunammite woman.

"Man does not live by bread alone". The members of the animal kingdom carry within themselves stores of most of their requirements, such as water, salts, and food in the ordinary sense, but they have no stores of oxygen, without which life becomes extinct. In their development through the eons of time it seems strange that for this substance of imperative need no mechanism has been evolved whereby a reserve might be accumulated. Even in those species which have a constant aqueous environment the acquisition of oxygen is a matter of the moment and is proceeded with incessantly to meet the continuous demands.

Respiration is commonly restricted to the intake of oxygen and the elimination of carbon dioxide by the lungs or their analogue. In a general way this is similar in all species in that the oxygen is acquired from the surrounding medium by diffusion through a more or less permeable membrane, on the internal side of which either the cell plasm or the blood trans-

* Being the Presidential Address delivered at the combined meeting of the American Medical and Canadian Medical Associations, at Atlantic City, June 11, 1935.

ports it to living cells where it now takes such vital part in their nutrition and life. These cellular activities may be termed "internal respiration".

It is now my purpose to review very briefly the beautifully subtle manner in which the animal organism through its various phases acquires for itself this essence of life imperative for its survival, and incidentally uses it for that love song, so to speak, with which to allure its mate for the perpetuation of its species.

We shall first consider the unicellular organism which in a way may represent the component parts which make up the whole of the higher orders, which are but an aggregated although organized arrangement of cells separated anatomically by physico-chemical interphases to make the tissues, organs, and complicated structures of the higher mammals, and even unto God's image, as we are pleased to call man. For such a unicellular organism I shall select the humble but sometimes deadly amœba, which, although it may have some excretory respiratory faculty, acquires the essence of life by direct inward diffusion due to the negative difference in the partial pressure of oxygen between its internal and its external environment. If we can imagine such a small cell acquiring the source of life and power from the sludge which surrounds it, we can quite easily appreciate how the primitive multicellular animal developing in the primordial mud must have evolved some more efficient means of acquiring this breath of life. As it progressed into more complicated entities and the competition for propagation became more intense, it necessarily had to move faster, and this demanded a more efficient method of locomotion than the plasmodial pseudopodia of yore. But increased movement requires an increased supply of oxygen. As by now the surface membrane for protective purposes has lost much of that quality suitable for the diffusion of gases, some means must be provided for the acquisition of the breath of life which is being required in increasing amounts. These means are ingenious and have numerous variations, but in principle are more or less the same. In special areas the cuticle remains thin and delicate, and may have a smooth surface or be thrown into folds with indentations of varying complexity. These may be considered as rudimentary gills. Their situation differs from species to species but there is one more or less constant feature, namely, they are on or near the organs of locomotion. I might take as a good example the Isopoda, in which respiration is effected by the broad rami of the abdominal limbs. The renewal of the water, containing the oxygen, upon the respiratory surfaces is brought about and accelerated by the movements of the limbs upon which they are located, but often certain appendages bear special lobes adapted to set up a current under the shell or carapace, and thus flush the chamber in which the gills are situated. So increased activity is served by serving itself.

As we proceed upward in the scale of development we find, as the consumption of oxygen in the tissues is more rapid, that there is an increasingly facile manner of acquiring it, until at last the medium containing it flows in increasing quantities past delicate membranes of vast area where freely circulates in capillaries the blood which is to acquire and carry the oxygen to the far distant cells, to play an essential part in nutrition. This is well exemplified in the completely developed gills of the fish. These delicate organs perform a wondrous task and can meet changes in external environment in a manner to arouse our admiration. In lakes and oceans and deep bodies of water the oxygen held in solution decreases as the depth increases. But even at the best of times the concentration is low. The great handicap under which the aquatic animal is living may be realized when it is considered that a litre of air at ordinary temperature contains 210 cubic centimetres of oxygen. A litre of water contains only 3 to 9 cubic centimetres. This means that aquatic animals have at their disposal at the most in a litre of their immediate environment less than one-twentieth of the amount of oxygen which an air-breathing animal has. To compensate for this, fish have a great capacity for extracting oxygen from the surrounding water, and can do so even when the variations of concentration fluctuate acutely over a relative range to which an air-breathing animal could not possibly accommodate itself so rapidly.

In addition to gills, fish have another interesting organ, namely, the swim bladder, which in some has a respiratory function. This organ

contains gases in practically the same proportion as in the surrounding medium and its contents usually vary therewith. In most fish it undoubtedly is filled by physical diffusion, but in other cases there would appear to be an active inward secretion of gases. About this point revolves one of the important physiological controversies of the day,— Can the human being secrete oxygen inwards if exposed to suitable environmental conditions? On this question I shall not tarry, as the future holds the solution. To return to the swim bladder—in addition to such respiratory functions as it may have, it acts as a hydrostatic organ, allowing the fish to volplane and loop-the-loop, dive to great depths and soar to the surface of its environment, and at the same time permits it to receive the triste song of its mate and to send her its call for one night of love.

But we must pass on to the amphibia, from which we shall choose the humble frog who, in pollywog days, has gills, but when he reaches his prime and becomes the basso profundo of his world he can not only breathe with his lungs but also through his skin, especially those forms which hibernate in the mud. So he can adapt himself to the vicissitudes of his environment and still acquire sufficient oxygen for his humble needs.

From the waters we now soar to the firmament above and consider the stream-line bird which acquires the oxygen from the air through its lungs, which are relatively small, but this is compensated for by the bronchial tubes connecting with air spaces extending into the bones. The inspired air is thus distributed all over the body so that aeration of the blood is not confined to the somewhat limited lung surfaces. This, however, serves another purpose, by lending lightness and buoyancy to the frame it helps the bird in its flight and rapid changes of altitude.

So, finally, we come to the mammals, the example of which will be man, whose external respiration is accomplished entirely through the lungs. He has no accessory or auxiliary respiratory mechanism. As the air is inspired it rapidly ventilates the lungs. This ventilation is so delicately adjusted and flexible as to maintain the oxygen content of the mean alveolar air at such a constant level under all ordinary circumstances as to saturate almost completely the hæmoglobin which acts as the oxygen reservoir for the blood plasma from whence the tissues obtain this breath of life. But this is not the only function of respiration. Biological processes may at times seem wasteful, but if so there is a reason, if we can find it, which will reveal that they are the best under the circumstances and are accomplishing other functions vitally important for preservation or propagation. In addition to supplying the body with oxygen respiration eliminates carbon dioxide, removes water, helps to regulate the body temperature, is the fine adjustor of the chemical reaction of our internal environment which is maintained with remarkable constancy, and, last, but not least, serves us to tell our own story. If this were all it would be wonderful enough. But man has not been content to remain in his ordained surroundings. He has aspired to imitate the fish of the sea and the birds of the air. He is an envious and interfering creature, always poking his nose into other people's back yards, spying on their personal affairs out of pure curiosity; and, to accomplish this he has used the ingenuity of Satan, because he is not equipped by respiration to do it without danger to himself. The curiosity of Eve and the wisdom of the serpent have driven him onwards, sometimes to his doom, in the name of truth and science. And the curious part of the whole thing is that he is succeeding.

When he aspired to invade the domain of the humble fish he thought the only thing necessary was to be supplied with the breath of life. But he soon found that his finned cousin had power to stand variations in external pressure such as would crush him to a pulp. Furthermore, this respiratory business was not so simple. There were other things to be taken into consideration besides oxygen. The laws of physics have an uncomfortable way of being consistent. Although 80 per cent of the atmosphere is nitrogen and of no account in life, he failed to appreciate that it still obeyed these laws and diffused into the plasma in amounts proportionate to the increase in the partial pressure. So, when he returned from visiting his friend the fish in the depths of the sea he became acutely aware that all was not well within him. He found himself full of bubbles; in fact he was like a soda-water bottle that has been suddenly uncorked, and he further found that air emboli have an

aggravating way of "gumming up the works", so to speak and the laugh was with the fish. But seeming defeat only made him more persistent. He found the reason and sought the remedy which in common with most truths was simple. Instead of uncorking himself suddenly he learned to do it gradually so as to blow off his excess nitrogen at a safe rate. But this was a slow process and inaccurate, so he decided to do this with mathematical precision and found he could "de-gas" himself not only more rapidly but with greater safety. So now, having mastered his respiratory difficulties he decided to visit his friend the fish and explore his habits and haunts whether he liked it or not. In fact, this Peeping Tom even took photographs without their permission, and the final insult was moving pictures of their most private and intimate doings. Poor fish! your privacy is gone for ever!

Man, having conquered the depths of the sea, turned his attention to the bowels of the earth. Many of his engineering difficulties were inherent in the human factor. But survival in compressed air solved certain of these and permitted him to burrow like a rabbit. In order to satisfy his craving for speed and his avarice for the treasures of mother earth he proceeded by exploratory operation and permanent anastomosis to expose her whole interior. Happily the earth worm and the gopher are not subjected to the indignities of the fish.

Since the beginning of time man has been envious of the bird. Envious of its freedom! Envious of its flight! Although he could burrow in the earth and swim in the sea he could not fly, so his soul was depressed and his spirit angry. Again defeat spurred him on until at last like the fledgling he made his first clumsy and blundering flight from his nest on earth. Now he had in his hand the possible means to out-fly and out-soar the bird and within a few short years this had been done. But he soon discovered that respiration put a limit to his ambitions. As he soared like the falcon into the eye of the sun he found there were limitations, not of his machine but within himself, in that the breath of life seemed to leave him. The atmosphere was there — it supported his bird-like structure — but it could not support him. The explanation was not far to seek. With the increasing altitude the partial pressure of the atmospheric gases steadily declined until finally that of oxygen was not sufficient to penetrate the alveolar walls to saturate the plasma and hæmoglobin in sufficient amounts to support life. Realizing that it is not the percentage of a gas which determines its rate of diffusion, but its partial pressure, which is the sum of its concentration and barometric pressure, man decided to increase the former as he could not alter the latter. So, with his oxygen tank and respirator he found the means to overcome his respiratory limitations.

Now we must leave external respiration and travel with the hæmoglobin and its load of oxygen along the labyrinth of the arterial tree to the cells of the body. It must be clearly remembered that these obtain their oxygen from the tissue fluids surrounding them, and these in turn receive it from the plasma of the blood with which it is in physical equilibrium. The amount of oxygen used by the tissues is in direct proportion to the amount of work done, although some tissues require more than others. As the oxygen in the tissue fluids and plasma is consumed it is immediately replenished from the oxy-hæmoglobin, the dissociation of which occurs with great rapidity. We are now back to the unicellular organism again. Whereas the amœba had to seek for the breath of life where best he could, our cells have it brought to them ready to use with the least effort on their part.

What do they do with it? This brings us to life itself. We must remember that in the structure of any organism, no matter how complex, the one purpose that is rigidly adhered to is the maintenance of a continual supply of energy to the individual cell. Our ancestors, with considerable justification from an imaginative standpoint, compared life to a flame. The contemplation of an open fire with flames of different form, colour and intensity, is impressive from the ever-varying, unordered and uncontrolled changes taking place. How similar are the processes of life! No living thing is absolutely still; alterations in position relative to environment, alterations in form, in growth, and, finally, changes in the atomic and molecular structure make for ceaseless activity; and just as the changes in a fire are physico-

chemical so also are the changes in living matter physico-chemical.

The power to live, the power to work, is not in the brain nor in the body, just as in a machine the power is not inherent in the pistons, valves, and fly-wheels. The power of living matter or machinery comes from without. What is this energy, how is it made available, and how does it operate in living matter? Of the total energy of the universe part is available for work (free kinetic energy), and part, not directly available. Our struggle for existence, as Boltzman has put it, "is the struggle for free energy".

What is our source of energy?

Firstly.—Plants act as the transformers of the kinetic energy of sunlight, converting it into the potential energy of carbohydrates, fats and proteins.

Secondly.—To understand how this energy is made available to the individual cell is to understand the fate of the foodstuffs following ingestion, and the changes undergone during digestion, absorption, and assimilation.

Lastly.—It is following the liberation of this potential energy in the animal organism that the internal respiration has its function.

Our modern conception of calories, combustion, and the fine values of foodstuffs has brought the idea of oxidation and heat production so much before our minds that we are apt to consider our bodies as a sort of glorified steam engine puffing laboriously through life on the calorific equivalents of breakfasts, lunches and dinners. The fallacy of this conception is shown by a brief consideration of Carnot's equation, whereby it can readily be shown that if the liberation of energy in our bodies took place by the conversion of foodstuffs to heat with a working efficiency of 25 per cent, then the temperature of the heat source would have to be 116° C. or, in other words, at a temperature 69° C. above the lethal point. It is quite evident then that when we convert bound energy into free energy conversion of foodstuffs into heat is not one of the steps. It is not known how living material is able to convert the chemical energy of foodstuffs into mechanical energy, but one thing we are sure of, the liberation of energy in the animal is invariably followed by oxidation and this oxidation takes place on or in the surface of the cellular units. Our entire respiratory mechanism with its colossal surface area of over 100 square metres and a red blood cell carrying surface of over 3,000 square metres exists for and is controlled by the demands of the tiny individual cells. The breath of life is oxygen; the seat of life is the cell.

I have already mentioned that most of the functioning systems carry out multiple tasks. This is one of the beautiful economies of the animal organism. As respiration is essential for the life of the individual, it is not surprising that it should play a part in arranging for the generations to come. It is true that this may be considered but an accessory function, but withal it is an important one in the propagation of the species. The most primitive song of love has not as yet been recorded, but we do know that in certain cœlenterata, of the free-swimming variety, there are ostocysts, called by more recent authorities "statocysts", as they are considered to serve a greater purpose for equilibrium than for hearing. That they serve both purposes there can be little doubt. The call of the earth-worm we do not know, nor that of the fish, but there is ample evidence to show that the gaseous swim bladder is used both for sending and receiving messages. Time does not permit mention of other species, but we cannot pass by that troubadour of the early summer night—the bull-frog. Who has not listened to his song and the answering chorus from afar? He takes no chances, being of the amphibians he sits at the water's edge and sends his stentorian basso through both the water and the air so that all may hear. His song is as sweet to the fortunate who understand as is that of the "blithe spirit" of which Shelley sang, or the serenade to the lovely maiden as she sits behind the balcony screen in old Seville. The breath by which life is maintained does its part to ensure that this spirit may be carried on in future generations.

Now I hand over the future of man to my esteemed colleague and friend, Doctor McLester.

NUTRITION AND THE FUTURE OF MAN*

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MAN'S place in future history will depend in no small degree on the food he eats. The truth of this was foreshadowed about two decades ago, when it was discovered that an animal's life processes may be profoundly disrupted by the omission from its food of any one of a number of substances, each of them ridiculously small in the amount required. Today there has been added the further, highly significant, observation that under certain circumstances an animal's life may be greatly improved by the addition of appropriate foods to a diet that previously had been regarded as entirely satisfactory. Through this knowledge physiologists have been able to influence to a surprising degree the life history of their experimental animals and in some instances so to improve the stock as apparently to produce a new species.[1] Can this be applied to man? Can man, by giving thought to the food he eats influence the destiny of his race? There is reason to believe that he can.

IMPROVEMENT OF RACIAL STOCK THROUGH DIET

Improvement of the stock as a result of betterment of the diet has been observed repeatedly both in the lower animals and in man. Among the earliest experiments in this field were those of Osborne and Mendel, who were able to show that what had previously been regarded as normal weight for the albino rat was not a fixed figure but was subject to material increase with improved nutritive conditions. The previously accepted standard weight of this experimental animal at 100 days of age, as established by Donaldson in 1906, was 165 g.; but a few years later, under improved nutritive conditions, the standard for rats of that age was raised to 200 g., and within another decade to an average weight of 315 g. In this series of experiments the increase in weight of the albino rat, beginning at 2 g. a day, was raised first to 4 g. and finally to 6 g. Thus, during a period of twenty years, under conditions that were not varied except for improvement in the ration, the rate of growth of these animals was trebled and the standard weight for the species was about doubled. This improvement has not been limited to mere increase in bulk, for there has been concomitant improvement in all phases of physical development, including growth of the bones and inner organs and, according to Sweezy,[2] changes in cellular structure. It should be emphasized that the earlier generations of rats on which these studies were begun were living on rations that at the time were apparently suitable, and that it was by reconstruction of a supposedly adequate diet in accordance with newly discovered nutritional principles that this improvement was effected. It would appear that by intelligent improvement of the animal's nutrition through successive generations a new species of albino rat has been developed.

Is the increased rate of growth of these animals to be regarded as wholly favourable? Most physiologists answer "yes", but McCay[3] states that such forced development, as he regards it, is not compatible with longevity. He believes that such animals age early and die prematurely. Against this criticism, Cowgill offers the pertinent suggestion that the increased metabolic needs of the more rapidly growing animals of McCay's series were possibly not met by commensurate increases in certain essential substances, and that under such circumstances a relative deficiency, with nutritive failure and consequent early senility, would necessarily follow. Of like import is the experience of Sherman,[4] who has observed that when an apparently adequate diet is enriched in certain of its chemical factors by an increase in the proportion of milk there results not only an increase in the rate of growth but also an improvement in vitality and in the animal's average length of life. It is well known that increased vigor and sustained longevity are among the notable accompaniments of improvement in an animal's

* President's address before the American Medical Association in joint meeting with the Canadian Medical Association, Atlantic City, N.J., June 11, 1935.

ration. It can safely be said, therefore, that the experiences of other physiologists are not entirely in accord with those of McCay and that the preponderance of evidence indicates that the increased growth achieved by well considered improvement in the diet is accompanied by general physiological betterment and definite improvement of the species.

IMPROVEMENT IN THE CHILDREN OF IMMIGRANTS

Have comparable changes, the result of improved living conditions, been observed in man? Yes, anthropologists tell of similar changes, which, while not so graphic as those seen in the lower animals, are none the less significant. Witness the report of Appleton[5] that Chinese living under improved nutritive conditions in Hawaii grow to greater stature than people of the same racial strain in China, and that their growth continues to a more advanced age than does the growth of those remaining in the less hospitable homeland. The average height at 20 years of age for the group studied in Hawaii was 1.1 inches greater than that of similar groups in the ancestral province of Kwantung. A similar report from Kanzaki[6] tells that children born of Japanese living in California show definite superiority in height, weight and other characteristics over their immigrant parents. The same can be said of other races who have emigrated to America, for it is of frequent comment in the larger American cities that children born in this country of European parents are of larger stature and better physique than their forebears. It is a common observation in medical schools that the Jewish students of European parentage who apply for admission are strikingly superior in physical attributes to their parents. The anatomist Todd[7] has recently commented on changes of the form of the head seen in the children of immigrants and of other changes which would indicate that the improvement in physique that is now being observed is not limited to mere increase in stature but is also an expression of better general development.

THE RESULTS OF HYGIENE AND IMPROVED NUTRITION

Such improvement in racial strain is not limited to those peoples who emigrate to more favoured lands, for like superiority of development is seen to accompany better living conditions among the children of natives both in this and in other countries. Witness the studies of children from different social groups in this country made by Gray and Nicholson[8] in eastern private schools and by Faher in San Francisco, indicating that those of the more favoured groups grow to a greater height. Of 4,000 women students who have entered Stanford University during the past thirty years, Mosher[9] found that, although the average age of women coming to the university today is less than formerly, the average height has increased a little more than one inch. She believes that the changes reported by her point to a more fully developed and more perfectly functioning type of American woman. Similar reports come from England. The anatomist Parsons, of the University of London, believes that hygiene and better nutrition have undoubtedly raised the height of upper class Englishmen, in illustration of which he cites the fact that while the average height of the modern English working classes may be taken as 5 feet 5 inches (165 cm.) that of the better nourished group is definitely higher, the average among medical students being 5 feet 9 inches (175 cm.). Of like import were the observations of Mann, undertaken for the British Medical Research Council, to the effect that, on the ordinary diets assumed by medical men to be proper for healthy development, the boys studied by him did not reach the full physical or mental growth of which they were capable, and that it was only when these diets were supplemented by milk that the best growth was attained. Similar evidence was seen in the more rapid growth observed during the large-scale experiment of distributing free milk to the school children of the Scottish county of Lanarkshire. Thus it is evident in man, as in the lower animals, that improvement in a diet that previously had been regarded as adequate will often result in a larger stature and a higher degree of development.

It should be emphasized, however, that larger stature is not the sole advantage that comes from improvement in diet, for there is abundant evidence that greater physical efficiency also follows. This was shown in a recent observation[11] that, of 160 English school children selected to compete in athletic events, 87 per cent of the winners were above the normal for

height and weight and only 6 per cent below normal, and that the winners showed a proportion of overweight three times that of the seconds, thirds or "also rans". From the English air service[12] comes the report that athletic prowess and the capacity to endure physical stress, except in long distance events, was found most commonly in overweight men and that men who are underweight on joining the service are more often invalided out than are those who are overweight. From Japan a public health bulletin[13] was issued, stating that, when groups of Tokyo school children were given milk as a supplement to the diet, not only was greater increase in weight and height observed but these children were more cheerful and happy and showed greater prowess in athletics than did those of the control groups. Experiences such as these have brought physiologists to the realization that a diet which appears to be adequate is not invariably the optimum diet. Far from it. In this connection Sir Frederick Hopkins[14] writes:

> The mere survival of a community, for instance, is too often taken as proof that the nutrition of its constituent individuals is adequate; lack of health or efficiency being attributed to racial or other uncontrollable factors. In social-economic surveys a race or community is found in equilibrium with an environment which includes its food supply. It is often forgotten that such environment is fortuitous and that the equilibrium reached is one in which the community, while managing to survive, may yet be functioning at levels far below those possible to its innate capacities. . . . . During the whole of history the needs of nutrition and the kind and amount of foods geographically available have played a great part in determining the destiny of races. Inadequacy in the supply has in some cases stunted innate capacities and led to the degeneration of a race; more generally in the past it has stimulated effort and led to migrations and wars of aggression.

In nutrition the words adequate and optimum are seldom synonymous.

The Influence of Heredity and Environment

Such statements would seem to deny the influence of heredity; but this is not true, for heredity and environment are both of influence. The two combine to shape man's destiny. The truth of this is seen in those instances in which inherited characters have been profoundly altered by environment. This applies to details of structure as well as to other physical attributes. Witness the great sensitiveness to nutritional disturbances exhibited by the growth centres in the bones of the face. In infancy nutritive deficiency has its effect on the transverse and antero-posterior dimensions, while after five years retardation of vertical growth is most apt to occur. This explains the changes in the shape of the face which Broadbent has demonstrated in malnourished infants, and the difference in facial expression observed by Boaz between the foreign-born and the American-born children of immigrant parents. While the exact type of structural change produced by nutritional failure depends somewhat on the nature of the deficiency, it is a rule that malnourished children, as was observed by the Bakwins,[15] suffer more in the growth of their transverse than in their longitudinal dimensions. The long bones continue to grow and there often results a thin individual with a misshapen chest and a gaunt, lanky appearance. This was beautifully stated by Todd,[7] when he wrote "The adult physical pattern is the outcome of growth along lines determined by heredity but enhanced, dwarfed, warped, or mutilated in its expression by the influence of environment in the adventures of life."

This influence of environment is far reaching. Under unfavourable environmental conditions the development of a person's finer qualities are sometimes seriously retarded, while, on the other hand, under optimal circumstances his less fortunate traits may be mitigated. Even his period of usefulness may be greatly extended. One may accept Warthin's view that man's span of life is fixed by inheritance and is unchangeable, but "lives there a man with soul so dead" who does not ardently desire some means by which within his allotted span he may lengthen the years of his usefulness. There is evidence, as was recently emphasized by Sherman,[4] that this can be done, that by improvement of a diet that already is apparently adequate man's prime of life, in both directions, may be considerably extended. The hastening of maturity may not be of interest to many people, but the postponement of senility through betterment of the diet is an alluring thought to every one.

The Gospel of Good Food

If such is the influence of environment, it should be possible through improved nutrition to bring mankind to a higher level of physical development. How is this to be accomplished?

In this respect the American people are not indifferent. Indeed, they are acutely food conscious and will eat anything that they are told is healthful; but to teach them what they properly should eat will require the combined efforts of a great many people, notably the teacher, the physician and the publicist. In addition, in order that people may, within the means at their disposal, get the foods they need, the help of the economist and the law maker must also be elicited.

Education comes first. Health education by means of nutrition classes, such as is being carried on in the public schools of my own and of other cities, can be expected to pay big dividends, for not only are the pupils themselves helped but these children carry the gospel of good food into the home and eventually elevate the nutritive standards of the entire family. It is a hopeful sign, too, that the physician himself is taking an infinitely greater interest in the science of nutrition than he has shown in the past. He can be expected to give to his patients dependable information which will eventually percolate throughout the community and bring widespread good; but unless he is also something of an economist he is apt to make the mistake at times of prescribing foods that the family budget will not afford. It is not sufficient, therefore, that the physician interest himself merely in the science of nutrition. He must study also the economics and distribution of foods and be prepared to prescribe diets that not only meet the patient's physiological needs but also are within his easy reach. The necessity for the wider dissemination of such knowledge is seen in the fact that a great deal of malnutrition comes from the unenlightened selection of foods made by the housewife with a rigidly restricted budget. It is unfortunate that many of the cheaper foods, such as the potato, which carry the greatest number of calories and have the highest satiety value, fall far short of providing in sufficient quantities such essential food factors as vitamins, minerals and good proteins. Vitamins and minerals can be obtained in abundance in fruits and vegetables, while proteins of high biological value are found in meats, eggs and milk; but these are all among the more costly foods. The important thing, therefore, is to know how in an economical manner to use these other more costly articles in order to supplement the less expensive foods. The experiments of Mendel and Osborne, and later of Cowgill and associates,[16] would indicate that the cheaper cereals can still be used as the mainstay of the diet provided properly selected supplementary foods, such as liver and lettuce, are added in suitable amounts. In the effort to secure economical but well balanced diets Cowgill believes that if sufficient intelligence is devoted to the selection of these supplements man can use cereals to a greater extent than is common today in this part of the world. It is because of its high supplementary value in a diet of cereals as well as of other foods that nutrition experts as a rule insist that a place be provided in the budget for definite quantities of milk and milk products. Even with today's high prevailing prices milk is still a bargain in food values. Thought must always be given to the protein allowance, too, since animal experiment as well as observations on man, such as those of Youmans in Tennessee, would indicate that protein is often the limiting factor in these cheaper diets. It is a function of the physician and the educator, then, to teach people the proper use of the protective foods in supplementing the cheaper diets.

THE IMPORTANCE OF FOOD HABITS

The food habits of a people are determined to an enormous degree by custom. What is commonly regarded as a diathesis or familial predisposition not infrequently, as has been pointed out by Cowgill, is an expression of the faulty food habits of the family. So dominating are the *tabus* and customs of a family or race as regards their food that these sometimes assume all of the force of *mores*. If the food habits of a people, because of poor supply, religious prejudice or other reason, are grievously at fault, in all likelihood these will be accompanied by a gradual deterioration of the family or race; if, on the other hand, these habits are good, this circumstance will be reflected in more advanced physical development, greater longevity, and a higher level of cultural attainment. Here in America, where so many foreign groups have brought with their Lares and Penates their food habits as well, racial customs must be taken into consideration. If these customs are good, the physician in offering advice must accept them;

if they are faulty, he must endeavour by education to combat them.

Political and Economic Factors

I do not wish to discuss the political implications of my subject, but it must be recognized that any plan that proposes to elevate racial standards by means of improved nutrition must give serious consideration to political and economic factors, for in the carrying out of such a plan food must be produced in adequate amounts and marketed at a price that the public can pay. It is difficult to estimate how many persons in this country are so poor that they are unable to purchase the food necessary to keep them in health; but if one takes the criterion adopted by Orr[17] in discussing the identical problem in England and assumes that those living on relief belong in this category it can be said that something like twenty million American people are living near or below the threshold of nutritive safety. This condition, if continued, will surely affect the health of the race. The income of these people must be raised or the price of food lowered.

To make agriculture profitable to the extent that a good rural population can be maintained and at the same time the rest of the population supplied with cheap food is a problem that confronts the nation. This is a subject for economists to discuss, but I should like to call attention to the report of the Elgin Committee, appointed to determine a National Agricultural policy for Scotland.[17] After offering the familiar advice that methods of distribution be so reorganized as to reduce the wide and growing difference between what the consumer pays and what the producer receives, the committee concluded that "it is in the interests of the state that the price of food should be kept so low that the poorest can obtain an adequate dietary". Adequate nutrition, then, is in the last analysis a problem of education and of government.

Mastery Through Science

In the past science has conferred on those peoples who availed themselves of the newer knowledge of infectious diseases better health and a greater average length of life. In the future it promises to those races who will take advantage of the newer knowledge of nutrition a larger stature, greater vigour, increased longevity and a higher level of cultural attainment. To a measurable degree, man is now master of his own destiny where once he was subject only to the grim hand of Fate.

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Relapsing Fever in the United States.—James O. Gillespie, San Antonio, Texas, believes that relapsing fever in the southwestern part of the United States is an important clinical entity and is being recognized with increasing frequency. As physicians become conscious of this disease the endemic area will be found to be much wider in extent than it is at present. Ornithodorus turicata has been proved a vector in Texas but in no other parts of the endemic area. Armadillos, opossums, tamarack squirrels and chipmunks may serve as reservoirs of infection in the endemic area. By simple laboratory methods available to all practising physicians, a positive diagnosis can readily be made. Clinically the temperature curve is the most important single clue in the diagnosis. Dark field examination of the blood taken during a paroxysm of fever is the method of choice for the demonstration of spirochætes present in large numbers. Thick blood smears, as prepared for malarial examination, are recommended, as they increase five fold the chances of finding the spirochætes. A specific remedy (arsenicals) exists and it is important that it be administered properly to avoid unnecessary relapses and complications. Inadequate dosage results in a prolongation of the afebrile interval. The low incidence of relapsing fever in endemic areas is due in part to the sparsely settled conditions and to the habits of the insect vector. With an increase in population and especially if infected areas become more congested as the result of grouping, such as occurs in camps of the Civilian Conservation Corps or in military mobilizations, higher morbidity and mortality may be expected. Within recent years in northern Africa, Nicolle and Anderson transmitted the relapsing fever of Tunis through both ticks and lice.—*J. Am. M. Ass.*, 1935, **104:** 1878.

VAGAL AND PHRENIC IMPULSES AND RESPIRATION

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SEVERAL studies of the nervous control of respiration have recently been made by utilizing the high gain amplifier in recording nerve impulses. Photographic records of afferent vagal impulses have been used by Adrian,[1] Keller and Loeser,[2] and Partridge[3] for an investigation of the messages reaching the respiratory centre from the stretch receptors in the lungs. Records of efferent phrenic impulses have been used by Adrian[1] to show the activity of the respiratory centre and the changes in the activity with stimulation of the stretch receptors. In Adrian's experiments the efferent phrenic impulses were recorded when the lungs were artificially distended and deflated. More detailed studies of this aspect of the problem are reported in one section of this paper. In another a reinvestigation of the respiratory function of the carotid sinus and cardiac depressor mechanisms during anoxæmia and excess carbon dioxide is described. Records of efferent phrenic impulses are used to show the change in the activity of the respiratory centre produced by inhalation of various gases before and after the denervation of the carotid sinus and section of the cardiac depressor nerves. The influence of these nerves on the rate of breathing has been studied previously by Heymans and Bouckaert,[4] Schmidt[5] and Gemmill, Reeves and Geiling.[6, 7] In a third section a reinvestigation of the vagal factor in the production of rapid shallow breathing with starch embolism of the lungs is reported. Records of vagal impulses are used to show the change in the afferent messages, and records of efferent phrenic impulses are used to demonstrate the change in the rate of breathing when a suspension of potato starch granules has been injected intravenously in an effort to produce multiple emboli in the pulmonary arterioles and capillaries of the lungs. This is superior to the indirect method of investigation where the vagal response was assumed to be changed with starch embolism, since no other factors were demonstrated to be responsible for the tachypnœa and since there was a general picture of congestion of the lungs. The indirect method was the only one available when Binger, Brow and Branch,[8] and Binger and Moore[9] investigated the problem. In a final section records showing the existence of sensory endings responding to extreme deflation of the lungs in the curarized rabbit are included. The author was unable previously[3] to identify such endings.

METHOD

Rabbits and cats were used. The rabbits were anæsthetized by doses of urethane intravenously. The cats were decerebrated. Various nerves were dissected out and arranged across two silver chloride wire electrodes which were connected to a high gain amplifier and Matthews oscillograph.[10] An optical system was arranged for recording on photographic paper. Usually the impulses in the whole nerve were recorded, but in some experiments photographic records of impulses in single fibres were obtained. The sheath of the nerve was removed, and the nerve was cut down with a fine steel needle until sound and photographic records indicated that only a few fibres of the nerve were conducting impulses. In a few experiments afferent vagal and efferent phrenic impulses were recorded simultaneously by using two amplifying systems. The movements of respiration were recorded by the pointer on a rubber tambour which was connected in some of the experiments to a glycerine tambour on the thorax of the animal, and in others to a side tube in the tracheal cannula or to a tambour attached to a strip of the diaphragm muscle. The inhalation of gas by the normal animal was effected from a 7 litre spirometer through small two-way mica valves. Artificial respiration for the curarized animal was supplied through a pneumatically-operated pump from the compressed air line or from a tank of compressed nitrogen, oxygen, or 7 per cent carbon dioxide and air. The starch embolism of the lungs was produced according to the technique of Binger, Brow and Branch.[8] A 1:75 suspension of potato starch in normal physiological saline, through which a fine stream of air was bubbled, was allowed to run slowly and intermittently from a burette into the external jugular vein.

RESULTS

Vagal control of the activity of the respiratory centre.—In the first series of experiments the influence of afferent vagal impulses on the activity of the respiratory centre was studied.

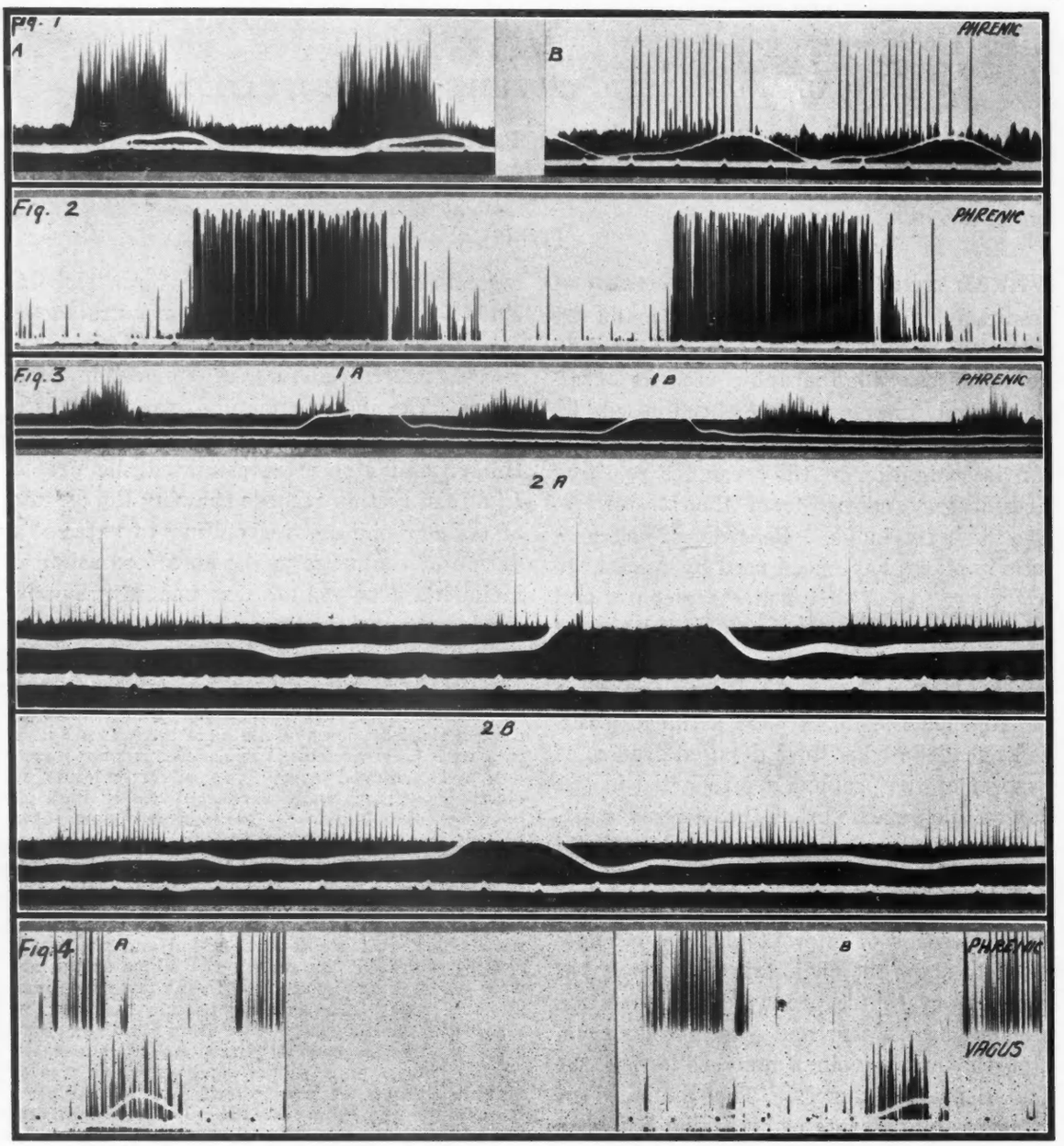

FIG. 1.—Rabbit. Urethane. Efferent impulses in the third cervical root of the phrenic nerve during normal respiration. A. Impulses in the entire nerve. B. Impulses in the single fibre. Discharge of respiratory centre during inspiration and period of recharging of centre during expiration. Time in 1/5 second. Wavy line at bottom is record of respiration. All records read left to right.

FIG. 2.—Efferent discharge in central end of third cervical root of phrenic nerve after the following nerves have been sectioned in turn: (1) cord at level of seventh cervical vertebra; (2) vagi; (3) cardiac depressors; (4) intercarotid sinus nerves; (5) carotid sinus connections to superior cervical ganglion and to vagus nerve; (6) superior and inferior laryngeals; (7) phrenics. Artificial respiration was given after the phrenics were cut, but stopped to obtain record. Time in 1/5 second.

FIG. 3.—Rabbit. Curare. Artificial distension and collapse of lungs. Efferent impulses in the phrenic nerve. 1. Whole nerve. 2. Single fibre. A. Distension (impulses from stretch receptors in the lungs) during the period of discharging of the centre. Both phases are shortened. Breathing tends to become shallower and faster. B. Distension (impulses from stretch receptors) during the period of recharging of the centre. Expiration and the succeeding inspiration are prolonged. Respiration tends to become slower and deeper. Time in 1/5 second. Wavy line represents artificial respiration.

FIG. 4.—Rabbit. Curare. Artificial distension of lungs. Efferent phrenic impulses (top) and afferent vagal impulses (bottom) obtained simultaneously using two amplifiers. A. Afferent vagal impulses during period of discharge inhibit the inspiration and shorten the succeeding expiration. B. Afferent vagal impulses during the period of recharging lengthen this period. 1/5 second intervals marked in along the base of records.

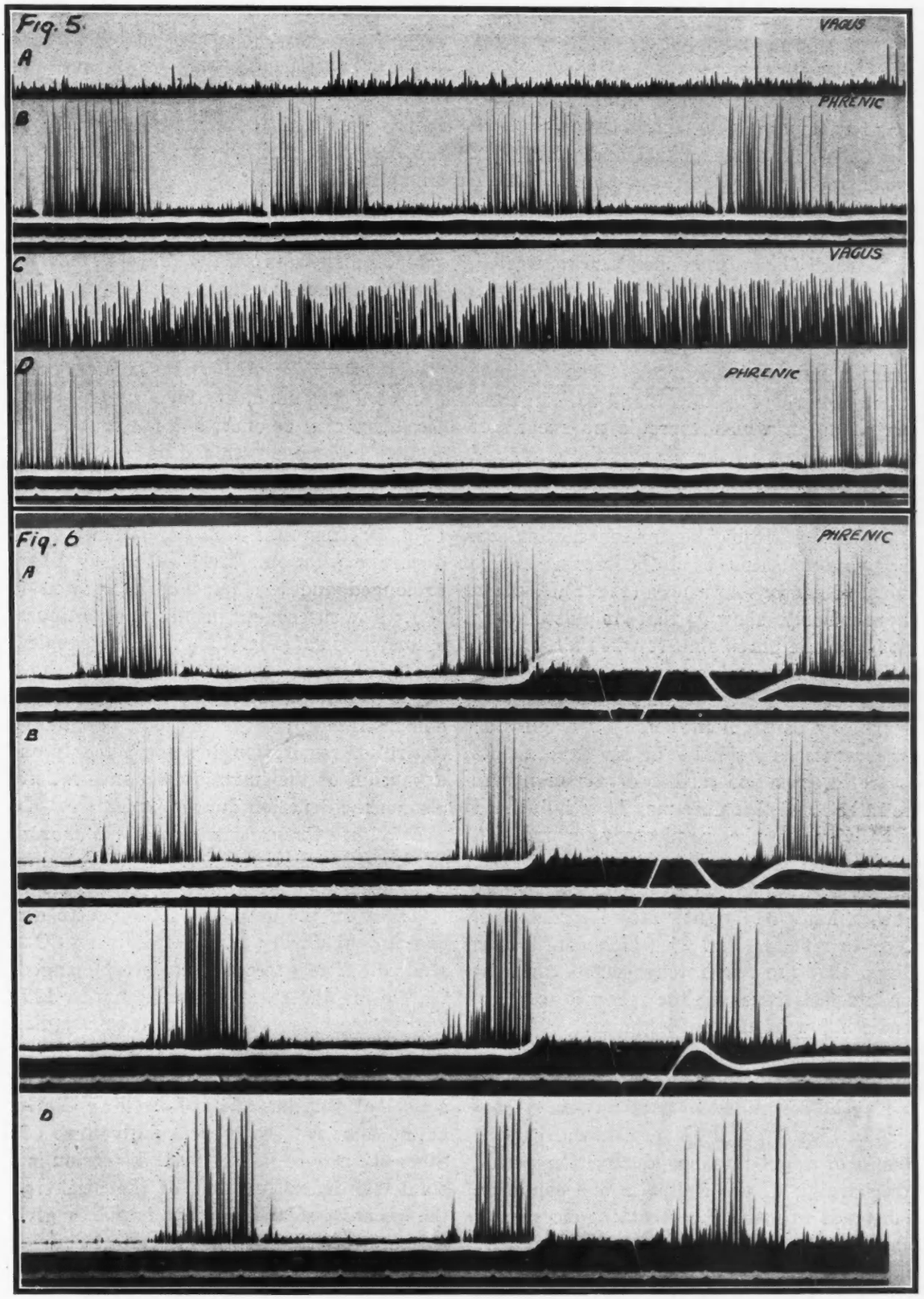

FIG. 5.—Rabbit. Urethane. Curare. A. Lungs deflated. Few afferent impulses in vagus nerve. B. Lungs deflated. Efferent impulses in phrenic nerve. Respiratory centre continues its activity in absence of vagal impulses. C. Lungs held distended 60 c.c. of air. Constant vagal impulses. D. Lungs distended. Phrenic impulses. Period of recharging lengthened. Respiration slowed. Time in 1/5 second.

FIG. 6.—Rabbit. Urethane. Curare. Artificial respiration. Efferent impulses in the phrenic nerve. Varying amounts of distension of the lungs during inspiration with deflation during expiration. Length of time of discharge and recharge show rate of respiration. Rate of breathing increases with volume of distension. A. Distension 40 c.c. Rate 46 per minute. B. Distension 50 c.c. Rate 50 per minute. C. Distension 60 c.c. Rate 60 per minute. D. Distension 90 c.c. Rate 72 per minute. Time in 1/5 second. Wavy line represents movements of respiration.

This was accomplished by artificially distending or deflating the lungs of the curarized rabbit and recording efferent phrenic impulses. In a few experiments simultaneous records were made of afferent vagal and of efferent phrenic impulses. Records obtained during normal respiration (Fig. 1) show that the activity of the respiratory centre, as Adrian and Bronk[11] have previously demonstrated, consists of a "discharge" coinciding with inspiration and a "recharge" occurring during expiration. This activity is not produced by afferent vagal impulses, since it can continue in their absence (Figs. 5B, 2 and 4). In these experiments in which there is no record of afferent impulses in the vagi of the curarized rabbit with deflated lungs, the centre continues to send impulses to the muscles of respiration. In fact the respiratory centre can continue its activity in the absence of all the known afferent rhythmical nervous influences (Fig. 2). Adrian had previously shown[1] that impulses were recorded in the phrenic nerve when all afferent impulses from stretch receptors in the lungs and from muscles were eliminated by allowing a temporary pause in the artificial respiration of the curarized animal. In his experiments the carotid sinus and cardiac depressor nerves were intact, and therefore may have influenced the activity of the respiratory centre. A repetition of Adrian's experiments, however, after the carotid sinus, cardiac depressor, and all other known afferent pathways had been cut, gives results (Fig. 2) which confirm his findings that the respiratory centre can continue its activities in the absence of any periodic inflow of afferent impulses. But Figs. 3, 4, 6, 7, 8 and 10 show how the activity is changed by vagal impulses, so that the respiration may be controlled in part by this mechanism. In Figs. 3A and 4A it is shown that the presence of vagal impulses during the period of discharging of the centre is one condition which tends to make the breathing faster and shallower. When vagal impulses, produced by artificially distending the lungs of the curarized rabbit, reach the centre during its period of discharge, the inspiration is cut short (Figs. 3A and 4A), and the breathing, therefore, tends to become shallower. The succeeding expiration is also shortened (Figs. 3A and 4A) and, since motor discharges to the muscles of respiration succeed one another more rapidly, the rate of breathing is increased. With a constant state of activity of the centre, vagal impulses exert their maximal effect in making the breathing fast and shallow when (*a*) the amount of distension of the lungs (the frequency of the afferent vagal impulses[1, 3]) during inspiration is greatest (Fig. 6), and (*b*) the rate of distension of the lungs is most rapid (Fig. 7), and (*c*) the deflation of the lungs (absence of impulses from stretch receptors) during expiration is most complete (Fig. 10). The tendency to fast and shallow breathing produced by impulses during the period of discharge may be offset and the breathing may tend to become slower and deeper if there is a very incomplete deflation of the lungs (Fig. 10A) or a very prolonged incomplete deflation (Fig. 8) (impulses from stretch receptors[1, 3]) during expiration. The expiratory phase is prolonged and the breathing is slowed (Fig. 3B). The succeeding inspiration continues for a longer time (Fig. 3B) and the respiration tends to become deeper. The results show, as Hammouda and Wilson[12] and Adrian[1] have demonstrated by other methods, that the vagal control of respiration depends not only on the expansion of the lungs during inspiration but also on the deflation during expiration.

Effect of afferent vagal impulses in anoxia and during CO_2 administration.—In a second series of experiments the influence of afferent vagal impulses on the activity of the centre during anoxia and during administration of CO_2 was studied. The gaseous state was changed by ventilating the curarized animal with 100 per cent nitrogen or with 7 per cent carbon dioxide and air. The same number of afferent impulses were sent to the centre before and after the period of ventilation by distending the lungs at the same rate with the same volume of air. Since the rate of the artificial distension is constant, the length of time of the discharge in the records of the phrenic impulses gives a measure of the depth of respiration. The results (Figs. 11A and 11B) show that when the carbon dioxide content of the respiratory centre is increased, the centre is less sensitive to vagal inhibition in the period of discharge. This period continues for a longer time and the depth of respiration is greater. That extreme lack of oxygen does not alter to such a marked

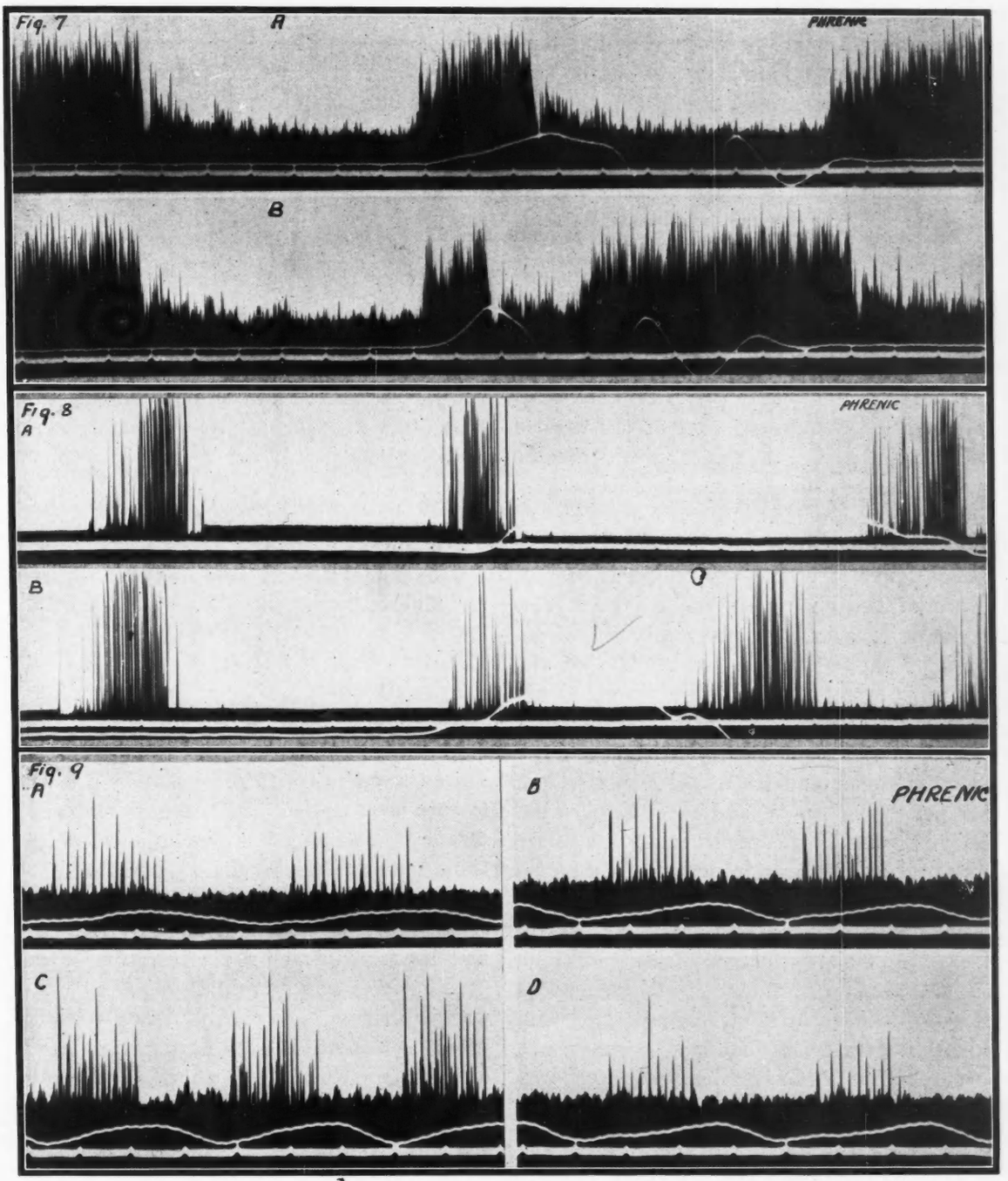

FIG. 7.—Rabbit. Urethane. Curare. Artificial respiration. Efferent impulses in phrenic nerve. Lungs distended with the same volume of air (60 c.c.) at varying rates during inspiration (and deflated at expiration). Respiration tends to be most rapid and shallow when the rate of distension is greatest. A. Slow expansion. Inspiration proceeds for 0.53 seconds. Rate 33 per minute. B. Rapid distension. Inspiration continues for 0.30 seconds. Rate 80 per minute. Time in 1/5 second. Wavy line is record of artificial respiration.

FIG. 8.—Rabbit. Urethane. Curare. Artificial respiration. Efferent impulses in the phrenic nerve. Lungs are distended with the same volume of air (60 c.c.) for varying lengths of time during expiration. Respiration is slowed with a prolonged distension during expiration. A. Expansion for 3 seconds. Rate 22 per minute. B. Expansion for 1.5 seconds. Rate 38 per minute.

FIG. 9.—Rabbit. Urethane. Efferent impulses in a few fibres of the phrenic nerve during the inhalation of 7 per cent carbon dioxide and air. There is an increase in the activity of the respiratory centre and in the rate and the depth of breathing. A. Beginning carbon dioxide. B. Approximately 20 seconds after beginning. C. Approximately 45 seconds after beginning. D. 20 seconds after removal of carbon dioxide. Inhalation of air. Time in 1/5 second. Wavy line is record of respiration.

degree the sensitivity of the respiratory centre to afferent vagal impulses during the discharge is shown in Figs. 11C and 11D. It can be seen that with constant vagal inhibition the discharge of the centre is limited in approximately the same time with extreme anoxæmia as with air. Thus the depth of respiration is not increased markedly by vagal impulses in extreme oxygen want.

The carotid sinus and excess carbon dioxide and oxygen want.—Studies were made of the changes in the activity of the respiratory centre and in the rate and depth of respiration with anoxæmia and carbon dioxide excess before and after the denervation of the carotid sinus area and section of the cardiac depressor nerves. Records of efferent impulses were used for these studies. Measurements of the length of time taken for the discharge and the recharge gave the rate of respiration. A measure of the change in the depth of diaphragmatic respiration was obtained from records of the movements of a strip of the diaphragm muscle. For these experiments rabbits were allowed to breathe mixtures of (*a*) 7 per cent carbon dioxide and air (*b*) 100 per cent nitrogen, and (*c*) 93 per cent nitrogen and 7 per cent oxygen, and records were obtained of phrenic nerve impulses in those animals whose respiration was markedly increased by the gases. Records of this series of experiments are shown in Figs. 9, 12, 13, 14 and 15. Fig. 9 shows that with carbon dioxide excess the activity of the respiratory centre is increased, the rate of breathing is faster, and the depth is greater. Adrian and Bronk[11] have reported similar findings from the records of impulses in the phrenic nerve during asphyxia. When the carotid sinus and cardiac depressor nerves are intact in normal and vagotomized animals the periods of discharge and recharge of the centre may be shortened and the rate and the depth of respiration may be increased by carbon dioxide excess and anoxæmia (Figs. 12 and 13). After the cardiac depressor nerves of the same animals have been cut and the carotid sinus areas denervated the time of discharge and recharge of the centre is still shortened and the rate and depth of respiration increased, with carbon dioxide excess (Fig. 14C), but during the first minute of anoxæmia there is very little change in the activity of the centre or in the respiration (Fig. 14B). When the anoxæmia is severe (100 per cent nitrogen), after approximately one minute the centre fails to discharge and the animal dies. When the anoxæmia is less severe (93 per cent nitrogen and 7 per cent oxygen), after two or three minutes there is occasionally a shortening of the period of discharge and an increase in the rate of respiration (Fig. 15B). These results indicate that the carotid sinus-cardiac depressor mechanism is responsible for the change in the activity of the respiratory centre and in the respiration during the first minute or so of anoxæmia, but that other mechanisms (peripheral or central) may act later to increase the rate of respiration. The change in the breathing with excess of carbon dioxide is not produced in the same way. These findings confirm those of Schmidt,[5] of Gemmill and Reeves,[6] and of Gemmill, Geiling and Reeves.[7]

STARCH EMBOLISM

In another series of experiments studies were made of the vagal impulses and the rate of respiration after a suspension of potato starch granules was injected intravenously in an effort to produce embolism of the pulmonary arterioles and capillaries. Records were made of the afferent vagal impulses when the lungs of the curarized rabbit were distended with the same volume of air before and after respiration had been hastened by the injection of a suspension of potato starch granules. The starch was judged to have produced rapid breathing when the length of time of the discharge and of the recharging became shorter in the records of the phrenic impulses obtained during the period following cessation of artificial respiration of constant rate and volume. The increase in the rate of breathing with starch embolism is not entirely produced by anoxæmia, since it occurs when the lungs of the curarized animal are ventilated throughout the experiment with 100 per cent oxygen (Fig. 17). The records (Figs. 16 and 18) show that with starch embolism there are changes in the afferent vagal impulses which could account in part at least for the change in the respiration. After the injection of starch the same volume of distension of the lungs initiates a greater number of afferent impulses by increasing the fre-

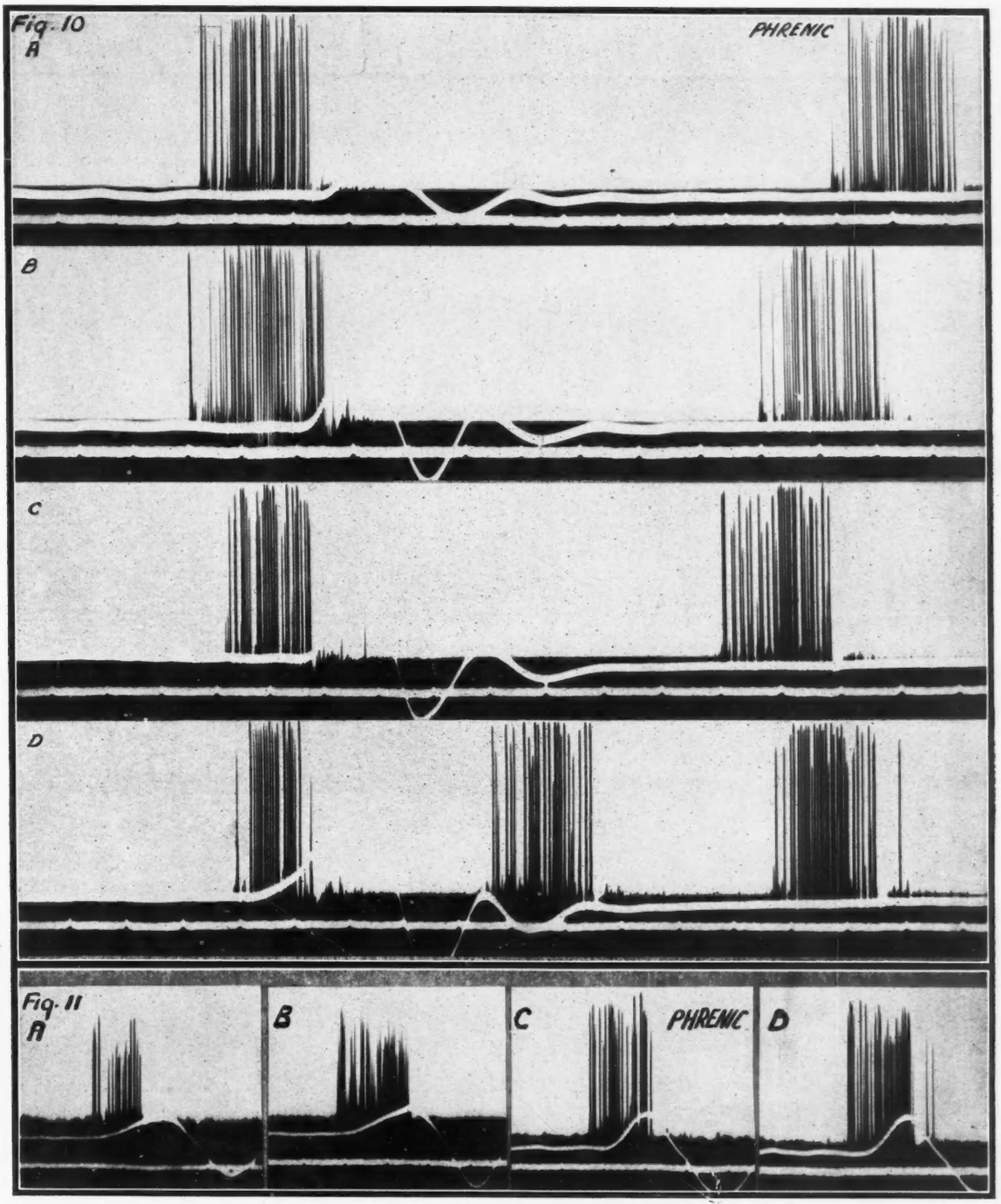

FIG. 10.—Rabbit. Urethane. Curare. Artificial respiration. Efferent impulses in the phrenic nerve. Constant amount of expansion of the lungs (total of 60 c.c. each time) and varying amounts of deflation. The rate is most rapid when the deflation is most complete. A. Deflation to 50 c.c. Rate 26 per minute. B. Deflation to 40 c.c. Rate 30 per minute. C. Deflation to 20 c.c. Rate 34 per minute. D. Complete deflation. Rate 63 per minute. Time in 1/5 second. Wavy line represents respiration.

FIG. 11.—Rabbit. Urethane. Curare. Efferent impulses in phrenic nerve. Activity of respiratory centre changed by artificial ventilation with various gases. A. and C. air. B. 7 per cent carbon dioxide and air. D. 100 per cent nitrogen. Afferent impulses in vagus same frequency for each experiment. Lungs expanded with 50 c.c. of air. A. and B. With high carbon dioxide the centre is less sensitive to vagal inhibition during the discharge. Inspiratory period prolonged and depth of breathing increased. C. and D. With extreme oxygen want the sensitivity of the centre to vagal impulses during the discharge is not greatly altered. Wavy line is record of respiration. Time in 1/5 second.

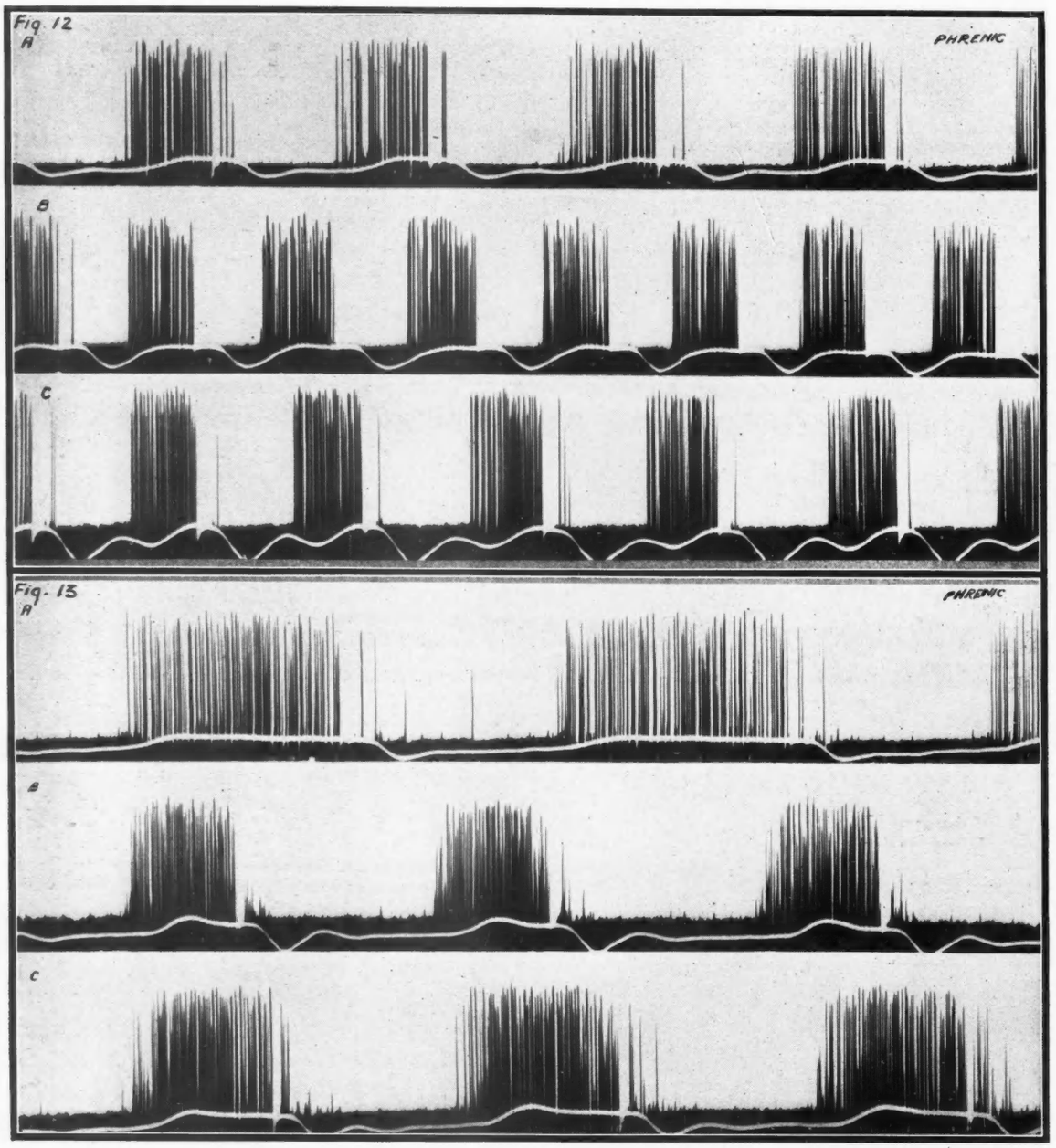

FIG. 12.—Rabbit. Urethane. Efferent impulses in phrenic nerve. Inhalation of various gases. A. Air. B. 100 per cent nitrogen. C. 7 per cent carbon dioxide and air. The increase in the rate is greater with severe oxygen want, while the increase in the depth is greater with this degree of carbon dioxide excess. Records taken 50 seconds after beginning of inhalation. Wavy line is record of contraction of strip of diaphragm muscle. Time in 1/5 second, marked in where too faint for reproduction.

FIG. 13.—Rabbit. Urethane. Vagotomized. Phrenic impulses. Same animal as in Fig. 12. Inhalation of various gases. Records made 50 seconds after beginning. A. Air. Cutting the vagi has slowed the respiration by increasing the length of time of discharge and recharge. B. 100 per cent nitrogen. C. 7 per cent dioxide and air. Inhalation of these gases may increase the rate and depth of respiration in the vagotomized animal. Wavy line record of contraction of diaphragm. Time in 1/5 second.

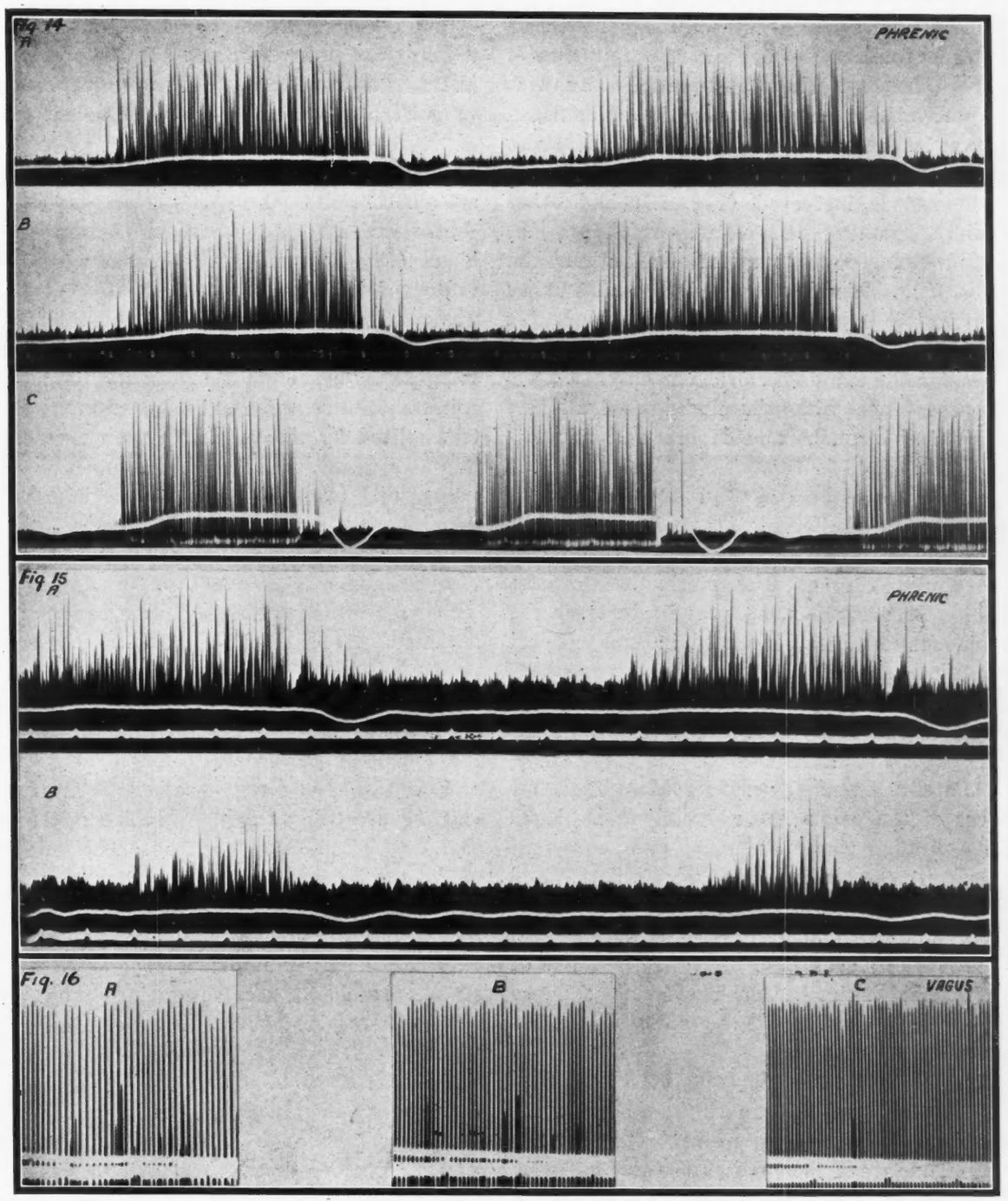

FIG. 14.—Rabbit. Urethane. Vagotomized, cardiac depressors cut, carotid sinus denervated. Phrenic impulses. Same animal as in Figs. 12 and 13. Inhalation of A. Air. B. 100 per cent nitrogen. C. 7 per cent carbon dioxide and air. Records 50 seconds after beginning. Carbon dioxide increases the rate and depth of respiration but 100 per cent nitrogen produces very little change. Wavy line is record of respiration. Time in 1/5 second.

FIG. 15.—Rabbit. Urethane. Vagotomized, cardiac depressors cut, carotid sinus denervated. Phrenic impulses. Anoxæmia produced by inhalation of 93 per cent nitrogen and 7 per cent oxygen. A. beginning. B. after 2½ minutes. Rate of respiration may be increased after a minute or two with this degree of anoxæmia. Wavy line is record of respiration. Time in 1/5 second.

FIG. 16.—Rabbit. Urethane. Curare. Afferent impulses in a single fibre of vagus nerve. Intravenous injection of potato starch. Response of stretch receptors is increased with starch embolism. Frequency calculated at end of first second from beginning of distension. A. Previous to injection of starch, frequency 63 per second. B. After 25 c.c. starch injected; frequency 85 per second. C. After 34 c.c. of starch, frequency 100 per second. Rate of breathing (activity of respiratory centre) as calculated from phrenic records made at same time was A, 25 per minute; B, 35 per minute; C. 47 per minute. Wavy line is record of artificial respiration. Time in 1/5 second.

quency in the single fibre of the vagus (Fig. 16) and probably by increasing the number of fibres (Fig. 18). The records suggest that with starch embolism the response of the vagal end organs in the lungs is abnormal. The response of the stretch receptors to a given volume of distension is increased (Fig. 16) and other rapidly adapting end organs which are not acting during normal respiration are stimulated (Fig. 18). This change (an increased number of vagal impulses during inspiration) is the one which would tend to account in part at least for the rapid shallow breathing. This is in accordance with the findings of Binger, Brow and Branch[8] and Moore and Binger,[9] that the vagus is responsible to some extent for the type of breathing produced by starch embolism of the lungs. Thus it may be, as these authors suggest, that certain changes in the lungs, through the mechanism of the Hering-Breuer reflex, account in part for the rapid shallow breathing seen in such clinical conditions as acute and chronic congestion of the lungs, lobar pneumonia, miliary tuberculosis and pulmonary fibrosis.

Endings stimulated by deflation of the lungs.—Afferent impulses were recorded in a few fibres of the vagus nerve during both phases of respiration when the lungs of the curarized animal were subjected to artificial inflation and very forcible suction (Fig. 19A). Previously the author[3] was unable to record a stimulation of endings by suction of air from the lungs of the normal animal. Such extreme collapse caused a movement of the animal and disturbances in the records did not permit the recognition of these nerve impulses. Keller and Loeser[2] and Adrian[1] have reported the presence of endings responsive to extreme deflation, but are of the opinion that such endings, which adapt themselves rapidly and therefore are probably different from the stretch receptors responding to distension, are seldom called into play. The results in Fig. 19B show that neither the stretch receptors nor the rapidly adapting endings are stimulated at deflation in an experiment in which the animal is breathing deeply following inhalation of 7 per cent carbon dioxide.

DISCUSSION

Recent investigations[1, 2, 3, 4, 6, 12] on the control of respiration have shown it to be a very complicated problem. The activity of the respiratory centre continuing in the absence of all the known rhythmical nervous influences[1] (Fig. 2), is dependent upon the gaseous content of the blood, and is changed by the afferent nervous impulses. The influence which these afferent impulses exert on the activity of the centre varies with the gaseous content of the blood (Fig. 11) and with the passage to the centre of impulses from other afferent pathways (Gesell, unpublished communication). The afferent impulses which probably have the greatest influence on the activity of the respiratory centre in normal respiration are those transmitted by the vagi. These nerves carry impulses from the stretch receptors in the lungs,[1] and from the studies made with valve amplifiers up to the present time there does not appear to be a response during normal respiration or moderate dyspnœa of the end-organs which are stimulated by extreme artificial deflation of the lungs[1, 2] (Fig. 19), and it seems probable that in the normal animal impulses are reaching the centre only when the lungs are distended.[1, 2, 3] When these impulses reach the centre during inspiration, the inspiratory and the expiratory activity are both cut short,[1] and the breathing tends to become faster and shallower (Figs. 3, 4, 6 and 7). The influence of the vagal impulses, however, may be to slow and deepen the breathing, when, with shallow respiration, the lungs are always partially distended and many impulses from stretch receptors reach the centre during expiration[1] (Figs. 3B and 10). The effect of the vagus on respiration, therefore, depends not only upon the distension of the lungs during inspiration but also upon the deflation during expiration.[1, 12] The impulses which the vagi transmit may be increased with certain pathological changes in the lungs and an abnormally rapid shallow type of breathing produced[8, 9] (Figs. 17, 16, and 18). It is possible that this is the etiological factor in certain clinical dyspnœas. Another afferent nervous mechanism which recently has been seen to influence respiration is that of the carotid sinus and arch of the aorta. The impulses from these nerves influence the activity of the respiratory centre during changes in carotid blood pressure[4] and during anoxæmia[4, 6, 7] (Figs. 12, 13, 14 and 15). During the first minute or so of anoxæmia these

nerves act to increase the activity of the centre and the rate of respiration but later other mechanisms may also perform this function. Apparently the increase in the activity of the respiratory centre with carbon dioxide excess[6, 7] (Figs. 9, 12, 13 and 14) is not produced through the carotid sinus or cardiac depressor nerves.

SUMMARY AND CONCLUSIONS

The action of the vagus and the carotid sinus and cardiac depressor nerves in respiration has been studied in normal and curarized rabbits by recording impulses in the whole nerve and in the single fibre of the vagus and the phrenic.

The vagal factor in the production of rapid shallow breathing with starch embolism of the lungs has also been studied by recording afferent impulses in the single fibre of the vagus after an intravenous injection of potato starch granules.

1. In the absence of any periodic inflow of afferent impulses the respiratory centre may continue its activity. After the phrenic, carotid sinus, and cardiac depressor nerves have been cut, as well as the cord at the level of the seventh cervical vertebra and the laryngeals, and artificial respiration of the curarized

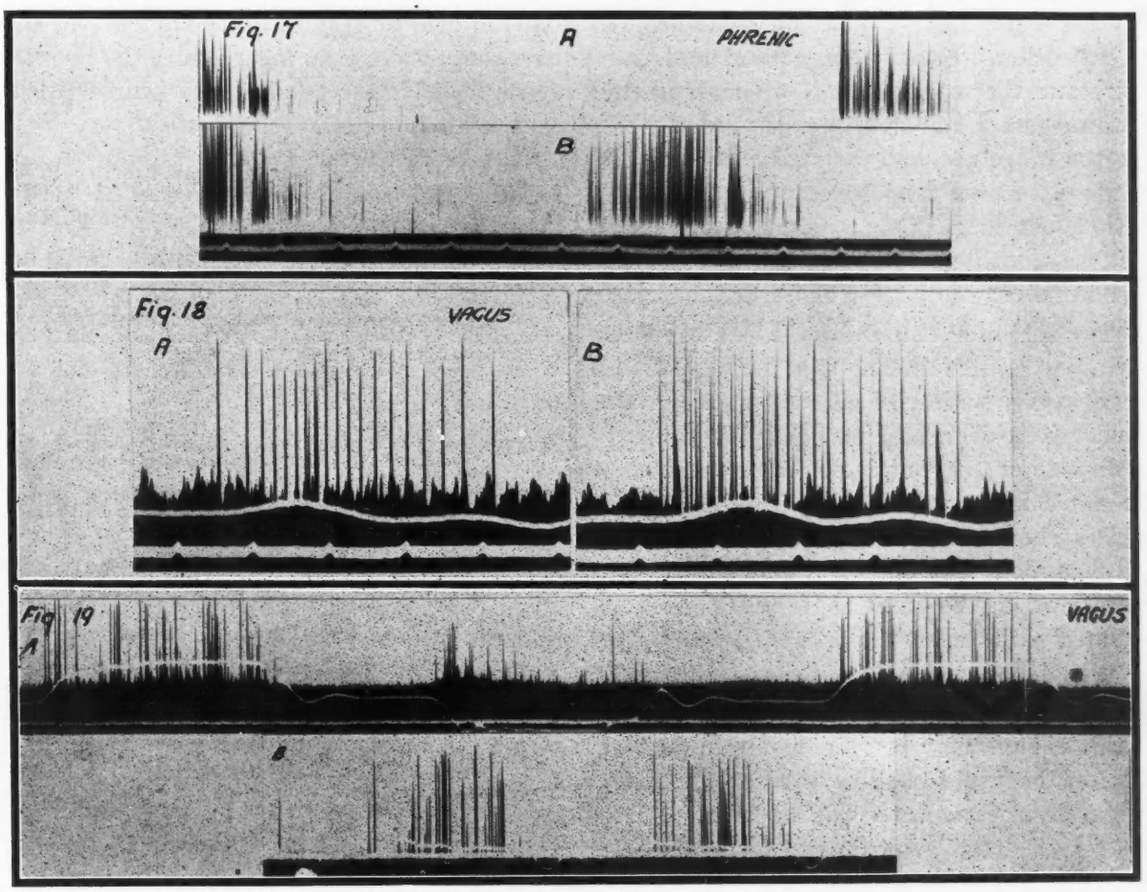

FIG. 17.—Rabbit. Urethane. Curare. Efferent impulses in the phrenic nerve. Rate of breathing increases after an intravenous injection of suspension of potato starch and artificial ventilation throughout the experiment with 100 per cent oxygen. A. Normal rate of activity of centre, 25 per minute. B. Rate of activity after starch injection and ventilation with oxygen 35 per minute. Time in 1/5 second.

FIG. 18.—Rabbit. Urethane. Curare. Afferent impulses in a few fibres of the vagus nerve. Intravenous injection of potato starch. The increase in number of impulses at beginning of expansion after the starch injection is probably from stimulation of rapidly adapting end organs which are not acting during normal respiration. A. Normal. B. After injection of 30 c.c. of suspension of potato starch. Wavy line is record of artificial respiration. Time in 1/5 second.

FIG. 19.—Rabbit. Urethane. Afferent impulses in a few fibres of vagus nerve. Extreme artificial deflation of lungs stimulates the endings, which adapt rapidly and therefore are probably different from the stretch receptors which respond to distension. With moderate dyspnœa there are no records of stimulation of these end organs at expiration. A. Curare. Lungs inflated and subjected to forcible suction. B. Inhalation of 7 per cent carbon dioxide. No impulses at expiration. Wavy line is record of respiration. Time in 1/5 second.

animal temporarily suspended, records are obtained of efferent phrenic impulses.

2. Afferent impulses from the stretch receptors in the lungs affect the activity of the respiratory centre and thereby help to control respiration. The impulses reaching the centre during its period of discharge inhibit this phase and cut short the period between discharges. The breathing tends to become shallower and faster. The impulses from stretch receptors reaching the centre during the expiratory period markedly prolong this phase, and seem slightly to lengthen the motor discharge. The breathing tends to become slower and deeper. The amount by which one effect overbalances the other determines the action of the vagus on respiration. Usually, in normal and deep respiration the vagal action of making the breathing faster and shallower is predominant, since the lungs are well deflated and there are few impulses from stretch receptors during expiration, but in shallow respiration the other effect may be the more pronounced, since the lungs are never completely deflated.

3. The inhibitory effect of the vagus on the respiratory centre during its period of discharge varies with the gaseous state of the animal. It is decreased markedly during carbon dioxide excess, but is not changed greatly with extreme anoxæmia. Records of phrenic impulses show that an artificial distension of the lungs does not inhibit the discharge as promptly when the curarized animal has been ventilated with carbon dioxide.

4. With starch embolism of the lungs the vagus has an increased influence on respiration, and this change may be responsible in part at least for the rapid shallow breathing. After the starch injection, records of single fibres show an increase in the number of vagal impulses during inspiration, and, theoretically, this change would tend to produce a rapid shallow type of respiration. That the rapid breathing is not entirely due to anoxæmia is shown in records of phrenic impulses where the motor discharges from the centre are hastened even during ventilation with oxygen.

5. The action of the carotid sinus and cardiac depressor mechanism on respiration during the first minute or so of anoxæmia in rabbits is to hasten breathing by cutting short the motor discharges and the intervening periods. This is later supplemented by other central or peripheral mechanisms for increasing the rate of respiration. The carotid sinus nerves apparently do not produce the increased activity of the respiratory centre during carbon dioxide excess.

The author would like to thank Prof. C. H. Best for his very helpful advice and for financial aid from the Medical Research Best Fund, and Joseph Brown for his excellent technical assistance.

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RADIOGRAPHY UPSIDE DOWN.—Changes in the radiographic appearance of the lung when the patient is (so to speak) standing on his head are reported by C. Malpelli, who thinks inversion of value in the diagnosis of pulmonary lesions. In the usual upright position, the lung tissue is distended by its own weight and this distension is greatest at the apex. In the inverted position, the relative opacity of the apex and base of the lung is altered, the former becoming more and the latter less opaque; at the same time the general distension of the organ is reduced, since its weight exerts traction chiefly on the diaphragm, which is elastic and deformable, instead of on the relatively rigid chest wall. Malpelli discusses the information obtainable chiefly in relation to the presence, extent, and stage of tuberculous lesions. A small exudative focus which escapes recognition in films taken in the normal position may, he holds, be revealed by inversion, the reason being that factors which make for increased opacity at the inverted apex are especially active in the diseased area. When collapse therapy is under consideration and the discovery of any disease in the contralateral lung is important, the method is said to be definitely helpful. An obvious objection is that the patient is obliged to be in an uncomfortable position when the pictures are taken, and it is doubtful if this would be practicable in any but the mildest cases. —*The Lancet*, 1935, **1:** 1228.

MADUROMYCOSIS: WITH THE REPORT OF A CASE DUE TO MONOSPORIUM APIOSPERMUM

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JUDGING from the literature, the clinical condition forming the subject of this paper is comparatively rare on this continent. Gellman and Gammel,[1] in 1933, published a Table of 9 authentic cases reported in the United States. Since, however, 8 of these have been recorded subsequently to January 1, 1921, it seems quite possible that the paucity of cases may be more apparent than real. Because of the interest now being shown in fungus diseases generally we feel rather fortunate in being able to bring this subject to the attention of Canadian physicians, and to report a case of maduromycosis that has come under our immediate observation.

Maduromycosis very closely resembles actinomycosis in its clinical picture and pathological tissue changes. The two conditions differ mainly in that their etiological agents are widely different. Maduromycosis results from invasion of the tissues by any one of a variety of moulds, whereas in actinomycosis each one of no fewer than thirteen species of the genus Actinomyces (filamentous higher bacteria) has at various times been identified as the causative agent. So closely do these two diseases resemble each other that often in a particular case identification of the true condition can only be made after microscopic and cultural examination of the infecting agent. In view of this there is nothing remarkable in the fact that many years elapsed between the date of the first description of that peculiar clinical condition "Madura foot", the subsequent recognition of the multiplicity of etiological agents, and the final differentiation into the two broad divisions already mentioned. Because of the confusion in nomenclature that has attended the development of our knowledge of these conditions it seems desirable to clarify the situation at the outset by a very brief statement of a few historical facts. For more complete information the reader is referred to papers by Gammel[2] and Thompson[3] and a text by Jacobson,[4] from which the following general and historical notes are mainly drawn.

In 1846 Colebrook, of the Madura Dispensary in India, used the name "Madura foot" to designate a disease of the feet prevalent in those parts and previously described for the first time in 1842 by his predecessor Gill. The discovery that fungi were the etiological agents of this affection was made by Vandyke Carter. He, in 1860, after a very thorough study of many cases, introduced the name "mycetoma" (fungus tumour), a term still retained in present day classification and used to include both actinomycosis and maduromycosis.

After the discovery of Actinomyces in diseased conditions of cattle in 1876 by Bollinger and in similar lesions in man by Israel in 1878, it came to be suspected that more than one organism was involved in the causation of the mycetomas, but it was not until 1894 that Boyce and Surveyor brought forward proof that those conditions being reported now as mycetoma and again as Madura foot were the result of infection, sometimes by moulds and sometimes by the Actinomyces, and in particular that in the mycetomas with yellow grains the Actinomyces were not infrequently the etiological agents. The term "true mycetoma" was introduced in 1913 by Pinoy, and applied to those mycetomas in which true moulds played the rôle of invader, in order to distinguish them from mycetomas of actinomycotic origin. Chalmers and Archibald, in 1916, because of the confusion which they foresaw was likely to result from this nomen-

clature, proposed to substitute the name maduromycosis for the term "true mycetoma" suggested by Pinoy.

The name "mycetoma" has been retained in the present classification, on the recommendation of these authors, and, as defined by them, includes all those conditions (both actinomycosis and maduromycosis) characterized by "growths and granulations in any of the tissues in man or animals, which are caused by fungi belonging to different genera and species, which produce bodies, called grains, composed of hyphæ and sometimes chlamydospores, and which are found either imbedded in the pathological tissues or escaping in the discharges therefrom."

Actinomycosis is commonly found about the face or neck, but it may either primarily or secondarily involve other parts of the body. The "grains" found in the discharge from the sinuses are usually yellow or white, and measure about 0.5 to 1.0 mm. in diameter. When crushed under a coverslip in moist preparation they show a central portion of indistinct morphology. At their edges it is not difficult to recognize the radiating arrangement of the clubbed ends of the filaments. No spores are present. When such granules are smeared and stained by Gram's method the filaments are found to be non-segmented, branched, and Gram-positive, with oftentimes a fragmentation of the Gram-positive elements, suggesting a chain of very small cocci. The filaments are about 0.5 microns in diameter.

In maduromycosis the grains may be black, ochroid (yellow or white), or, rarely, red, depending on the nature of the mould playing the etiological rôle. The grains measure 0.5 to 1.0 or 2.0 mm. in diameter, and are formed of hyphæ and chlamydospores. The hyphæ are much broader than those in actinomycotic grains, measuring 2 to 4 microns, are well walled, segmented and branched. In our specimens a definite radiating arrangement of the hyphæ at the periphery of the granule could readily be made out, and round spores (chlamydospores) were quite a prominent feature.

ETIOLOGY OF MADUROMYCOSIS

Prevalence.—In the literature we have consulted the prevalence of maduromycosis is not clearly stated. Most statements deal with the mycetomas. From this it may be understood that laboratory work has not, as yet, been done on a sufficiently large number of cases to permit proper statistical evaluation as between actinomycosis and maduromycosis. The disease is mainly one of tropical and subtropical zones. Besides being endemic in India it has been reported from both American continents, Europe and Africa. Gammel,[2] in 1927, in a review of 21 reported cases of mycetoma in the United States of America, was only able to find 3 that could be regarded as proved maduromycosis. Since that time 6 others have been added. The first of the American cases was reported by Wright, of Boston, in 1898. All others have been recorded since January 1, 1921, the last being by Gellman and Gammel in 1933.

In 1895, Adami and Kirkpatrick[5] reported under the title "Mycetoma Pedis, Ochroid Variety" what is believed to be the first recorded case of maduromycosis on the North American continent. The patient was a French-Canadian, aged 21 years, born in Montreal, where he had lived all his previous life with the exception of five years passed in the Province of Ontario. His disease began at 11 years of age, up to which time he had lived in Montreal. The infecting fungus produced yellow "grains", and was distinguished by Adami from Actinomyces by the presence of hyphæ of large size and by the fact that the hyphæ were segmented. The organism was not cultured nor further identified, but there seems no doubt that the condition was one of maduromycosis.

Predisposing causes.—Maduromycosis in the large majority of cases appears as a disease of the feet, and is usually associated with the habit of going barefooted. Ninety-three of the 100 cases of mycetoma studied by Bocarro, of Hyderabad, 8 of the 9 authentic cases of maduromycosis reported from the United States, and Adami's case involved the foot. Of the American cases only Puestow's[6] patient was affected in other parts, namely, the face, mastoid region and right forearm. The ages of the patients varied from 12 to 80 years, the majority being between 21 and 40. In India, agriculturists and rural dwellers have suffered most frequently. Injury, often of a trivial nature, has usually been cited by the patient as initiating the attack.

Etiological agents. — Nineteen species of moulds belonging to both the Fungi imperfecti and the Ascomycetes, and distributed among

eight genera, are recorded by Gammel[2] as having been identified as etiological agents as follows:—

	Species
Fungi imperfecti:	
Genus Madurella	8
Genus Indiella	3
Genus Glenospora	2
Genus Scedosporium (Monosporium)	2
Ascomycetes:	
Genus Allescheria	1
Genus Aspergillus	1
Genus Sterigmatocystis	1
Genus Penicilium	1

The following comprehensive table (Table I) from the paper by Gellman and Gammel[1] relating to the 9 American cases is herewith reproduced. It has been modified by us to include their own case.

TABLE I

MADUROMYCOSIS IN UNITED STATES

(Gellman and Gammel[1])

Modified to include their own case reported in 1933

Author	*State*	*Localization*	*Colour of grains*	*Causative fungus*	*Where reported*
J. H. Wright	Mass.	Foot	Black	Unknown	*Tr. A. Am. Phys.*, 1898, **13:** 471.
Boyd and Crutchfield	Texas	Foot	White	*Allescheria boydii*	*Am. J. Trop. Med.*, (July) 1921, **1:** 215.
Gammel, Miskdjian and Thatcher	Ohio	Foot	Black	*Madurella americana*	*Arch. Derm. & Syph.*, (Jan.) 1926, **13:** 66.
Thompson and Ikeda	Minn.	Foot	Black	*Madurella ikedai*	*Arch. Surgery*, (Mar.) 1928, **16:** 764.
C. R. Halloran	N.Y.	Foot	Melanoid	Unknown	*Arch. Derm. & Syph.*, (Nov.) 1927, **16:** 611.
Puestow	Wis.	Nose, cheek, mastoid, neck and forearm	Black	*Aspergillus nidulans*	*Arch. Derm. & Syph.*, (Nov.) 1929, **20:** 642.
Gay and Bigelow	Mass.	Foot	White	*Monosporium apiospermum*	*Am. J. of Path.*, (May) 1930, **6:** 325.
Jones and Alden	Ga.	Foot	White	*Monosporium apiospermum*	*J. Am. M. Ass.*, (Jan.) 1931, **96:** 256.
Gellman and Gammel	Md.	Foot	.....	*Monosporium apiospermum*	*Arch. of Surgery*, (Feb.) 1933, **26:** 295.

The onset of the disease is insidious, the patients finding it difficult to establish a definite date of origin. The course is slow and progress is by extension. No drugs appear to have any beneficial effect. Resort must be had to wide excision or amputation.

Since the case we are reporting is one diagnosed as resulting from invasion by *Monosporium apiospermum*, we record also from these authors their finding with regard to the world prevalence of this type of infection. Thirteen cases were discovered in the literature; 3 from Italy, 3 from Brazil, 1 from Paraguay, 3 from Algeria and 3 from the United States.

CASE HISTORY

D.R.L., white, male, aged 42, a farmer, was admitted to the University Hospital, Edmonton, on May 15, 1934.

In 1902 he lacerated his left foot by catching it in a waggon wheel. The wound apparently healed easily and only bothered him slightly until 1909 when it broke down and discharged. He was operated upon, but drainage continued. In that year he had further surgical procedures on the upper end of the tibia and the upper and lower ends of the fibula. The leg was put in a plaster cast. When the cast was removed the wounds had healed, but the ankle was stiff. The leg was never really strong after this.

In 1913 it began to discharge again and continued to do so until 1927 when the patient noticed the swelling spreading upward. In 1928 he had a course of typhoid vaccine treatment. In 1929 a swelling appeared about the middle of the shin and spread upwards to the knee in 1931. It kept enlarging and spread around the lateral side of the leg to the popliteal space. This was treated surgically, but a few weeks later a small lump was noticed on the posterior surface of the leg. In the six months previous to admission there had been extension to just above the knee.

The patient was born in Kansas, and lived there until coming to Canada in 1916, where he has lived ever since. He had had typhoid fever in 1909, measles in 1910 and a cataract of the right eye in 1928.

On admission to hospital he showed an enlarged left leg and foot with multiple scars up to the knee. These scarred areas showed excoriation and scabbing. There was a fairly large semi-fluctuant area below the knee. There were some swelling and induration just above the condyles of the femur. There was no movement of the foot or ankle. The whole leg and foot up to the knee were bluish-red and somewhat indurated. He did not complain of much pain.

The Wassermann test was negative. Urinalysis showed acidity; specific gravity 1.030; no albumin; no glucose; and was microscopically negative. Blood count: hæmoglobin, 90 per cent; red blood cells, 4,400,000; white blood cells, 5,950.

X-ray showed a periostitis of the fibula and a chronic osteomyelitis of the tibia and tarsus, with obliteration of the joint spaces of the foot and ankle.

A provisional diagnosis of actinomycosis was made.

The fluctuant area below the knee was aspirated, but as the area above the knee began to discharge, amputation through the thigh was considered to be the immediate treatment. On June 1st an amputation by anterior flap was performed, at the junction of the middle and lower thirds of the thigh. The patient made

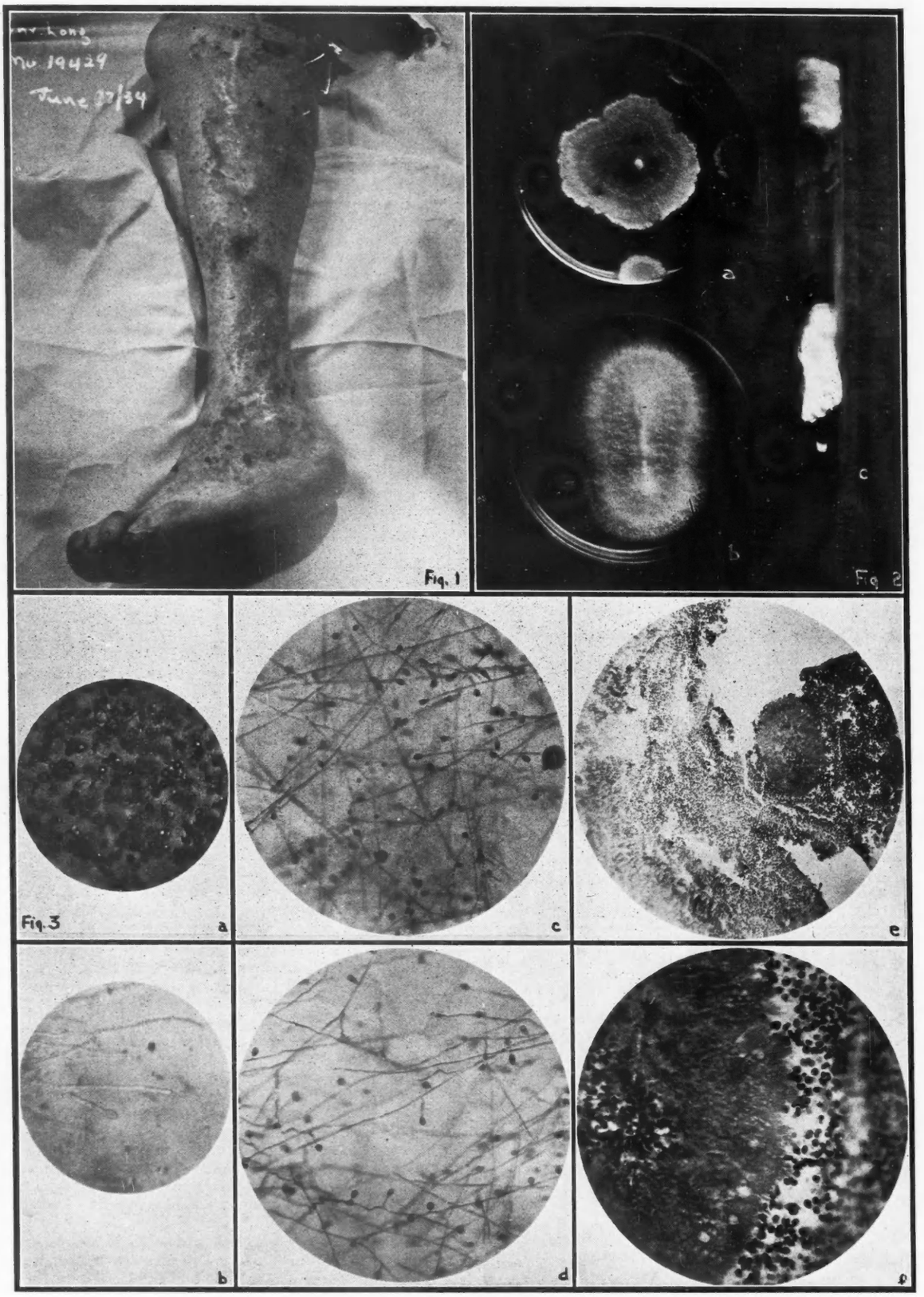

FIG. 1.—Showing extensive involvement of the leg.
FIG. 2. a.—A culture, 18 days old, made after removal of the leg. Central white knob is the granule used for inoculation. Plate contaminated by bacteria.
b. and c.—Plate and tube subcultures 13 and 19 days old respectively.
FIG. 3. a.—Crushed granule showing round spores. High power.
b.—Growing edge of young colony. High power.
c. and d.—Five day cultures x 420.
e.—Section of tissue through granule x 70.
f.—Some section of tissue showing high power view of edge of granule x 420.

an uneventful recovery, except that on June 30th, under a local anæsthetic, the inturned edges of the wound at one corner had to be everted. He was discharged on July 17th, with wounds healed and a temporary peg leg.

Pathological report.—The specimen consists of a left leg, which has been amputated at the junction of the middle and lower one-third of the thigh.

The leg is greatly swollen, particularly in the region of the knee. The skin from the foot to the knee is dry and brown and large flakes of desquamating epithelium are being cast off. Many old scars are present. These scars are irregular in outline, with puckered margins and central depressions, apparently representing healed sinuses. The skin is firmly fixed to the deep tissues. As well as old scars, there are many more recent lesions. These take the form of deep sinuses, some of which are discharging thick brownish material. Others show an attempt at healing and are covered with a filmy layer of epithelium, and a few are covered with thick brownish black crusts. Pressure on the soft tissues around the sinuses forces out thick brown fluid, in which are seen many fine yellow grains, bearing a close resemblance to the sulphur granules of actinomycosis.

Dissection of the leg shows the presence of much dense scar tissue, replacing the fatty subcutaneous tissue and extending into the muscles. Here and there narrow sinuses can be traced from the skin surface down to the periosteum, which is greatly thickened. No definite extension into the bone was demonstrated. The sinuses are filled with necrotic material containing many small round yellow granules. The ankle joint and small joints of the foot are fused and immovable.

Histological examination (hæmatoxylin and eosin stain).—The histological lesion is very similar to that of actinomycosis. Sections through the wall of a sinus show a central collection of pus, in which bodies resembling the *Actinomyces bovis* are seen. These bodies are oval or somewhat irregular in outline, and are composed of a central filamentous mass which takes a basic stain, surrounded by a narrow pink-staining area in which a definite radial arrangement of filaments can be distinguished. Near the margins, large numbers of small clear bodies can be seen. These are regarded as chlamydospores. They are oval or round and vary somewhat in size. They are clearly seen near the periphery, but are difficult to make out in the centre of the fungal mass.

Surrounding the central collection of pus in which the fungi lie there is a narrow zone of recently formed granulation tissue containing large numbers of leukocytes, including polymorphonuclears, plasma cells, lymphocytes, eosinophiles, and large mononuclear phagocytic cells. No giant cells of the foreign body type were seen. Still farther out there is an abundance of dense, rather sparsely cellular, fibrous tissue. The whole picture is one of a chronic productive inflammatory lesion.

Mycology.—The fluid submitted for examination was sanguino-purulent. Scattered through it were many small yellowish bodies which by the naked eye could not be distinguished from the "sulphur grains" obtained from actinomycotic lesions. These grains were of an irregularly spherical shape, very hard, and varied in size from 0.45 mm. to 1.0 mm. in diameter. When crushed under a coverslip (a difficult procedure because of the hardness) and examined in moist preparation, microscopically, they were found to be composed of a large number of round and some oval or elongated bodies. Towards the periphery of a carefully crushed granule one could see radiating mould-like filaments. These filaments measured 3 to 4 microns in diameter, and both in moist and stained preparations showed both branching and segmentation.

The spherical bodies were estimated to vary in size from 5 to 20 microns. Those smaller (5 to 14 microns) appeared to have thicker walls than those of larger size. Scattered through the protoplasm of many of them were a varying number of highly refractile droplets or granules; a few presented only one large refractile droplet. A drop of Gram's iodine added to the moist preparation appeared to bring these into greater prominence and to show as well, particularly in the large, though also in some of the smaller, cells, an oval slightly brownish shadowy form occupying rather more than one-third of the cell and in which there were none of the refractile elements. The smaller thick-walled rounded bodies, measuring 5 to 14 microns, were regarded as spores (chlamydospores). It is probable that some of the larger bodies, measuring up to 20 microns, belonged to the same category. It was not possible to arrive at any opinion as to the point of origin of the spores. Dried smears stained by carbol-thionine, Gram's and Leishmann's stains revealed some leucocytes and a few large segmented, branching, filaments which exhibited intercalary swellings. It may well be that the swellings are early stages of the free chlamydospores observed in the moist preparations. Spores themselves could not be obtained in the dried stained smear.

Cultures made by placing "grains" on Sabouraud's maltose agar, rabbit's blood agar, and glucose-agar plates and tubes grew well aërobically at both 37.5° C. and room temperatures. Some slight evidence of growth was apparent in twenty-four hours, and by three days there was present a well developed downy growth. In plate cultures the granule, larger by reason of the growth of hyphæ over and about it, formed a central knob, around which the growth spread in about three weeks to occupy a very considerable part of the plate (see photograph). Some plate cultures showed concentric rings.

Darkening of the cultures began in about four to eight days at the centre, and followed the white margin of growth as it spread toward the edge of the plate. The growth was not more than 3 or 4 mm. in height. The hyphæ were very closely set. Moist preparations were made from ordinary cultures and examined in the unstained state. The best results, however, were obtained by growing cultures on a drop of glucose agar, on a sterile slide in a Petri plate, and examining either in the unstained state under a coverslip or stained with rose bengal.

Under the microscope the growth was seen to be composed of branched filaments or hyphæ, 2 to 4 microns in diameter, and segmented rather infrequently, though more frequently in older hyphæ. Branching was irregular and the branches were widely spaced. Lateral branches from a main filament branched in turn. Fusion (or anastomosis) of hyphæ was occasionally seen. Refractile droplets were seen scattered here and there throughout the hyphæ. Old hyphæ were yellow or brownish and showed oval enlargements. Conidia were produced at the ends of long branches, or, laterally to these, on short conidiophores. They were pyriform and attached by their more tapering truncated ends. In some cultures longer narrower conidia appear. Usually only one conidium is borne at the end of a hypha, but a number of examples were observed where two were present, and on one occasion three were seen. Detached conidia in young cultures measured 4.5 to 5.5 microns in their greatest width by 6.5 to 8.5 microns in length. In older cultures many conidia were longer 11.0 microns and narrower 4.0 microns. Some conidia in the older cultures were brownish. The darkening observed at the surface of the medium was probably due to both spores and filaments.

Germination of the conidia was observed under the microscope to take place within twenty-four hours, the young hyphæ emerging in most instances from the lateral aspect, but sometimes from the truncated end. Growth of our organism was slightly more luxuriant and more rapid at 37.5° C. than at room temperature. There was no fermentation of sucrose, lactose, glucose, mannite nor maltose when incubated at 37.5° C. for fourteen days, though growth was luxuriant. Litmus milk was rendered alkaline. Gelatin and Loeffler's blood serum were both liquefied, the former within five days, but the latter more slowly, showing definite liquefaction after

eleven days' cultivation. These cultural reactions are not in agreement with the findings of Gay and Bigelow,[7] who observed liquefaction of blood serum and coagulated egg medium but not of gelatin, and the production of gas in dextrose and lactose, while there was no fermentation of sucrose. However, the cultural reactions do not appear to be regarded of importance in identification.

The composition of the "granules" found in the discharge from the lesions, notably the presence in these of large branched, segmented hyphæ and spores, led to the diagnosis — Madurомycosis. By comparing the morphological findings and cultural appearance of the fungus with descriptions by Gellman and Gammel[1] and by Gay and Bigelow,[7] we felt justified in designating our organism — *Monosporium apiospermum* (*Scedosporium apiospermum*) Saccardo 1911.

Our culture was passed on to Dr. E. S. Dowding[8] for mycological examination. The result of this study is published in the next article (page 28) in this *Journal*.

SUMMARY

A case of maduromycosis of the lower extremity is presented. The etiological agent is regarded by us to be *Monosporium apiospermum*.

A description of the fungus as to its morphology, cultural appearances, and reactions is given, as well as the gross and microscopic pathological findings.

A brief summary of the historical background is also included.

We believe this to be the first case of maduromycosis due to *Monosporium apiospermum* reported from Canada.

To Dr. F. H. H. Mewburn, Clinical Professor of Orthopædic Surgery, University of Alberta, we wish to acknowledge our indebtedness for the clinical history and for the privilege of reporting this case.

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MONOSPORIUM APIOSPERMUM, A FUNGUS CAUSING MADURA FOOT IN CANADA*

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Edmonton

Monosporium apiospermum Sacc. has been isolated in three regions of North America from patients suffering from maduromycosis: in Georgia,[6] in Maryland,[5] and in Massachusetts.[4] In the present number[9] there is published the first record of the fungus in Canada.

M. apiospermum is a member of the Imperfect Fungi which produces terminal ovoid conidia. The fullest descriptions of the fungus in the literature are by Saccardo, quoted by Gammel,[3] and by C. W. Dodge in a paper by Gay and Bigelow,[4] but even these are brief and are not easily available to Canadian readers. It was therefore considered advisable to augment and more fully illustrate the previous mycological descriptions.

* This work was made possible by a grant from the Carnegie Research Fund of the University of Alberta.

MATERIAL AND METHODS

M. apiospermum was isolated in Edmonton by Dr. R. M. Shaw,[9] from a patient suffering from maduromycosis. Dr. Shaw's cultures were used for the present investigation, together with two cultures which were obtained from Europe for comparison. One of these was obtained from the Centraal Bureau voor Schimmelcultures in Baarn, and the other, probably an Italian strain, from the National Collection of Type Cultures at the Lister Institute in London.

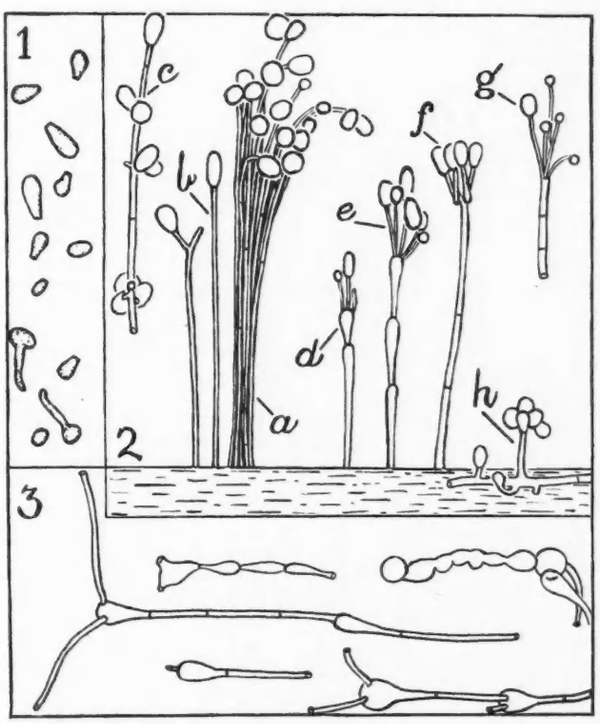
M. apiospermum is readily obtained on a variety of culture media by inoculating agar slants with "grains" expressed from the diseased foot. Mycelia for the present investigation have been cultivated on glucose-agar, on Sabouraud's medium at 28° C. in test-tubes, and in Van Tieghem cells. The fungus has also

been grown on drops of glucose broth on slides in a damp chamber. The latter method was convenient because it was only necessary to add a cover-slip to the drop, without disturbing the mycelium, for microscopical examination of the preparation with the oil-immersion objective.

THE MYCELIUM

After inoculating *M. apiospermum* on an appropriate medium, the mycelium grows rapidly and comes to cover the substratum to a depth of about 5 mm. with a dense growth of snow-white aërial hyphæ. In about two weeks after inoculation the white growth gradually darkens to a smoky colour, described as "cinnamon drab" in Ridgway's Colour Standards.[8] In the Alberta strain the whole mycelium eventually becomes cinnamon drab. In the two European strains the mycelium darkens to the same colour at the periphery, but remains for the most part white.

The strains of *M. apiospermum* isolated in Georgia by Jones and Alden,[6] in Maryland by Gellman and Gammel,[5] and in Massachusetts by Gay and Bigelow,[4] have all produced in culture black pin-head-sized sclerotia. The Canadian strain, on the other hand, although kept in culture in Edmonton for six months, has never produced sclerotia. Likewise the two European strains growing in the laboratory were not sclerotia-producing. Cultures from two to four weeks old frequently produce a closely-growing dark-brown "turf" of aërial hyphæ on the surface of the medium, so short as to be covered over by the web of aërial mycelium, but visible in profile against the sides of the glass tube. The layer is composed of a thick growth of erect brown conidiophores (Fig. 5) which will later be described in detail. The brown layer is not constantly present and disappears when the cultures begin to dry out.



FIGS. 1 TO 3.—*Monosporium apiospermum* (x 375)

FIG. 1.—Conidia.

FIG. 2.—Conidiophores: (*a*) a small tuft separated out from the coating of erect conidiophores which covered the medium, (*b*) a conidiophore of the simplest type, (*c*) Monilia-like hypha, (*d*), (*e*), (*f*), (*g*), conidiophores with terminal whorls of sterigmata (some of the conidia are immature), (*h*) prostrate conidiophore growing on the agar surface, with four sterigmata.

FIG. 3.—Vegetative hyphæ showing swellings.

The mycelium from Alberta conforms with the previous description of *M. apiospermum* from the Maryland culture in being sparingly branched, septate, and 2 to 4 μ in width. It has not been noted in previous descriptions of the fungus that swellings 8 to 10 μ in diameter may occur in terminal or intercalary positions on the hyphæ. What is of particular interest is that the intercalary swellings are frequently confined to the distal portion of each cell (Fig. 3). Hyphæ with such regularly occurring swellings throughout their length occur in many dermatophytes, *e.g.*, *Microsporon lanosum*.[2] They are described by medical mycologists as "racquet hyphæ", and are considered of some importance in classification. The presence of racquet hyphæ in *Monosporium apiospermum* may point to some relationship between this fungus and the ringworm fungi.

THE CONIDIOPHORES

Saccardo, quoted by Gammel,[3] describes the conidiophores of *M. apiospermum* as decumbent and not erect. He remarks that the species is separated from other members of the genus by its prostrate habit; he might have added that its habit as he described it was closer to Sporotrichum. Subsequently Gay and Bigelow[4] stated that the aerial mycelium is made up of *erect* as well as of decumbent conidiophores.

In the Alberta cultures the conidiophores vary in appearance according to whether they are growing in the medium or in the air. In the

medium they become sinuous, prostrate and hyaline (Figs. 4 and 6), undifferentiated in appearance from the vegetative hyphæ. In the air they have a tendency to become straight and erect (Fig. 2*b*), especially the conidiophores making up the brown turf on the surface of the agar. The erect conidiophores are differentiated from the vegetative hyphæ in often being slightly wider at the base than at the apex and in becoming brown-walled with age. They are 100 to 150 μ high, usually septate, sometimes with swellings of the distal part of each segment, and occasionally producing whorls of erect sterigmata at the apex (Figs. 2 and 8). From an examination of the figures we may conclude that *M. apiospermum* is similar to other members of the genus in the possession of erect conidiophores.

THE CONIDIA

In *M. apiospermum,* as the generic name implies, the conidia are borne singly. They are usually formed at the apex of the conidiophores, but they may be lateral in position when they are borne upon short tapering sterigmata. In the Alberta strain a conidiophore may produce a whorl of 2 to 5 sterigmata. When the whorls are borne laterally the conidiophore has a Monilia-like appearance (Fig. 2*c*); when they are terminal the conidiophore looks more like a Penicillium (Fig. 2*f*). Gellman and Gammel[5] observed that spores sometimes occur in groups instead of singly, and for this reason they hesitated at first to identify this fungus as a *Monosporium.* Gay and Bigelow[4] observed spores in groups, arranged either side by side or end to end at the ends of the conidiophores. The writer has also found spores in groups. Spores are sometimes produced in succession from the same place; the first spore is pushed aside by the second, and the second by the third. Careful examination of the spore groups in Fig. 7 reveals that only one spore is actually attached to each sterigma. Often the conidiophore excretes drops of liquid which come to contain the spores floating within them, just as the drops of liquid on the mycelium of one of the Shaggy Mane fungi, *Coprinus lagopus,* contain oidia.[1]

The spores are typically pear-shaped, although occasional oval conidia are found. They are attached to the conidiophores at their narrower ends; a detached spore shows a faceted surface on the narrow end where it was attached to the conidiophore (Fig. 1). The spores measure 8.5 to 10 μ by 5.5 to 7 μ. They are continuous, usually hyaline but sometimes becoming amber-walled.

The conidia germinate readily on various media. When a number were sown in a smear of glucose-agar on a slide, within 24 hours they became swollen and a single germ-tube was produced from the end or the side of each. The germ-tubes grew four or five times the length of the conidium, and then their apices enlarged to form a secondary conidium (Fig. 9).

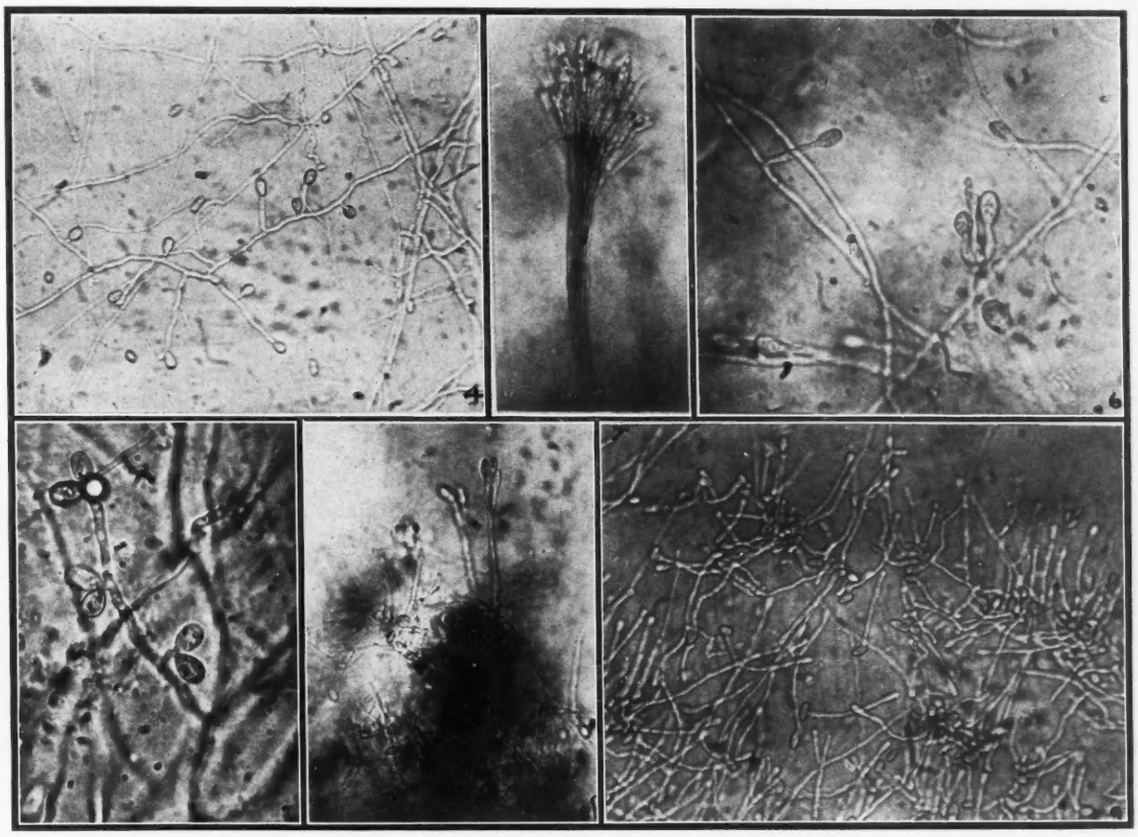
A TEST FOR PATHOGENICITY OF A MONOSPORIUM-LIKE FUNGUS FROM ALBERTA SOIL

In 1934 Dr. G. B. Sanford, of the Dominion Laboratory of Plant Pathology, isolated a fungus resembling Monosporium from pustules on the surface of a potato tuber grown in Alberta. Dr. G. R. Bisby, of the University of Manitoba, identified it as a Geomyces, as described by Traaen.[10]

The culture of *Geomyces sp.* interested the writer because, except for the smaller dimensions of its hyphæ and spores, it resembled *Aleurisma apiosperma** described by Montpellier and Gouillon[7] as a cause of white-grain maduromycosis in Algeria. The Alberta *Geomyces sp.* was cultivated on potato dextrose agar, where it produced a white aërial mycelium, parts of which later became snuff-brown in colour.[8] The hyphæ are about 1.5 μ in diameter, frequently breaking up into chains of oidia. The terminal spores are pyriform, measuring 3 x 3 to 6 μ, and are set free by the disintegration of the hyphæ.

Since *Monosporium apiospermum* is known to be pathogenic to guinea-pigs, a sterile spore suspension of Geomyces was inoculated into a guinea-pig (*a*) intradermally, (*b*) subcutaneously, and (*c*) by rubbing it on the surface of the scratched skin. Two months after the inoculations the guinea-pig showed no symptoms of disease. This experiment goes to show that the Alberta *Geomyces sp.* is not pathogenic to

* *Aleurisma apiospermum* Maire has been considered a synonym of *Monosporium apiospermum* by Saccardo, but the Algerian *A. Apiospermum* differs from *M. apiospermum* Sacc. in that the spores are set free by the disintegration of the mycelium.



FIGS 4 TO 9.—*Monosporium apiospermum*

FIG. 4.—Prostrate conidiophores growing within a drop of glucose broth, after two days (x 300).
FIG. 5.—Tuft of erect aërial conidiophores teased out in water (x 300).
FIG. 6.—Conidiophores as in Fig. 1. In the centre is a terminal whorl of four sterigmata: the conidiophore producing them is not in focus (x 700).
FIG. 7.—Conidiophore with three sterigmata, to show how the first-formed spores are pushed aside by the succeeding ones (x 700).
FIG. 8.—Two erect conidiophores, one with four terminal sterigmata (x 300).
FIG. 9.—Germinating conidia which have produced secondary conidia at the apices of the germ tubes (x 300).

animals in the time allowed, in spite of the fact that it resembles certain fungi of Madura foot.

SUMMARY

1. *Monosporium apiospermum*, which has been isolated for the first time in Canada, has been grown on culture media, and a comparison has been made with cultures of the same fungus obtained from Europe.

In addition to characters previously described, the following features have been observed:—

(*a*) The cultures darken from white to cinnamon drab. Unlike the strains obtained in the United States, they produce no sclerotia. They frequently exhibit a growth of short dark-brown aërial hyphæ.

(*b*) The mycelium is characterized by terminal and intercalary swellings and "racquet hyphæ" resembling the growth forms of many dermatophytes.

(*c*) The form of the conidiophores depends on their habit of growth; when they are submerged in the medium they are undifferentiated from the other hyphæ; when they are growing in the air they become erect, tapering and dark-coloured.

(*d*) The sterigmata sometimes occur on the conidiophores in whorls of 2 to 5.

(*e*) The spores are normally borne singly, but sometimes collect in groups, when a sterigma produces several spores in succession.

2. *Geomyces sp.*, isolated from Alberta soil, resembles certain fungi causing maduromycosis, but it was found not to be pathogenic to an experimental guinea-pig.

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FOCAL EPILEPTIC DISCHARGE IN A CASE OF TUMOUR OF THE POSTERIOR TEMPORAL REGION*

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CASE REPORT

N.D., a farmer of 45 years, presented at the Montreal Neurological Society, November 7, 1934. This patient was referred to the Montreal Neurological Institute from Bath, N.B., by Dr. William Lockhart. He complained on admission of *headache* of three months' duration, *loss of memory, difficulty with speech, diplopia,* and *roaring* in the ears. His family history and general past history were essentially negative.

The headaches, beginning three months previously, had increased steadily in severity. They were situated in the vertex, but extended down into the left parietal and occipital regions, and were made worse by stooping. His loss of memory seemed to begin about two months previously, when one day, as he was talking to the hired man, he became unable to continue the conversation. The man laughed at him; whereupon the patient went into the house, said to his wife, "I don't know what ails me." After that he seemed to be unable to say anything more. But later in the day he continued his work as usual. After this episode his wife noted that he would come into the kitchen and stand around, not knowing what to do. For example, he might come in as though to wash his face and would not know where the wash-bowl was, or how to go about it. He would forget where he put his clothes, and could find them only after standing and thinking for a long time. In spite of all this he continued to run his farm until three weeks before admission.

For a month or two the patient noted, when he was out of doors, that frequently he saw two men approaching him, and as they drew near he discovered that they became one. He had no lights before his eyes nor at any time a feeling of blindness. For the previous two months at least, and perhaps much longer, he had noted a roaring noise constantly in his ears. He was not quite sure on which side it was more marked, and the roaring came in paroxysms. He stated that he had never had any loss of consciousness nor convulsions, but on closer questioning we found that he had had certain confused periods, which I shall describe in detail a little later.

Physical examination.—He was a tall, strong man, obviously in excellent general condition. General examination revealed little that was abnormal. The blood pressure was 110/90. There was atrophy of the right testis, which was only 3 centimetres in length compared with 7 on the left.

Mental status.—Before operation there was marked impairment of memory. He could not remember accurately nor in detail any of his previously well remembered experiences when he was overseas. He remembered that he had been married for six years, but his reaction time was slow, requiring sometimes four or five minutes to answer a question. At other times he responded quite quickly. He had a definite nominal aphasia at times and was distressed at not being able to name objects. He seemed to understand questions put to him quite clearly and he obeyed commands.

Cranial nerves.—1st, sense of smell was present but reduced in the left nostril. 2nd, vision 6/6 in both eyes. There was a right homonymous hemianopsia, with definite sparing of central vision on the blind side. He was examined by Dr. John MacMillan who reported as follows: "I think the maculæ are spared. Patient does not cooperate well, but I am certain that there is sparing inside a five degree circle." Dr. MacMillan reported further that "the nerve head looked normal. There is a little haziness of the nerve head in both sides, but well inside the physiological limit." 7th, voluntary movements of the face were quite symmetrical on the two sides. Emotional movements of the face, especially on smiling, showed slight but definite weakness of the lower portion of the right side of the face. As you see, this weakness has now disappeared. 8th, he was somewhat deaf in both ears. This seemed to be of the nerve-deafness type. Otherwise the cranial nerves were normal.

Motor system.—The patient describes himself as being two-handed. Up to the age of fifteen he wrote with his left hand and then changed and wrote with his right hand, simply because he broke his left forearm. It is quite obvious that he was habitually and instinctively a left-handed man, but a dynamometer test showed the left grip to be registered at 85; the right at 115, perhaps due to the old fracture; otherwise the muscular power seemed normal. There was no alteration in tone.

Reflexes.—Deep reflexes, normal and present, excepting that the right ankle jerk could be obtained only on re-inforcement; the left could not be obtained at all. The abdominal reflexes were equal and active; cremasteric reflexes, present. The plantar responses were flexor on both sides.

Sensation.—No disturbance of any form of sensation. No astereognosis, although there might be difficulty in recalling the name he wanted to use.

Coordination.—Finger-finger and finger-nose tests and heel-knee-tibia test were well performed. The finer movements of the hands were equally well carried out on the two sides. When testing for adiadochokinesia there was a little slowness and difficulty of alternating movements of the right forearm. The Rhomberg sign was negative. No apraxia.

X-ray examination.—The pineal gland was found to be calcified and shifted somewhat from left to right. The lateral view (Fig. 2) made it clear that the left anterior clinoid process was partly absorbed. Both clinoids were somewhat depressed, but the left more so than the right.

* Read before a meeting of the Montreal Neurological Society November 7, 1934.

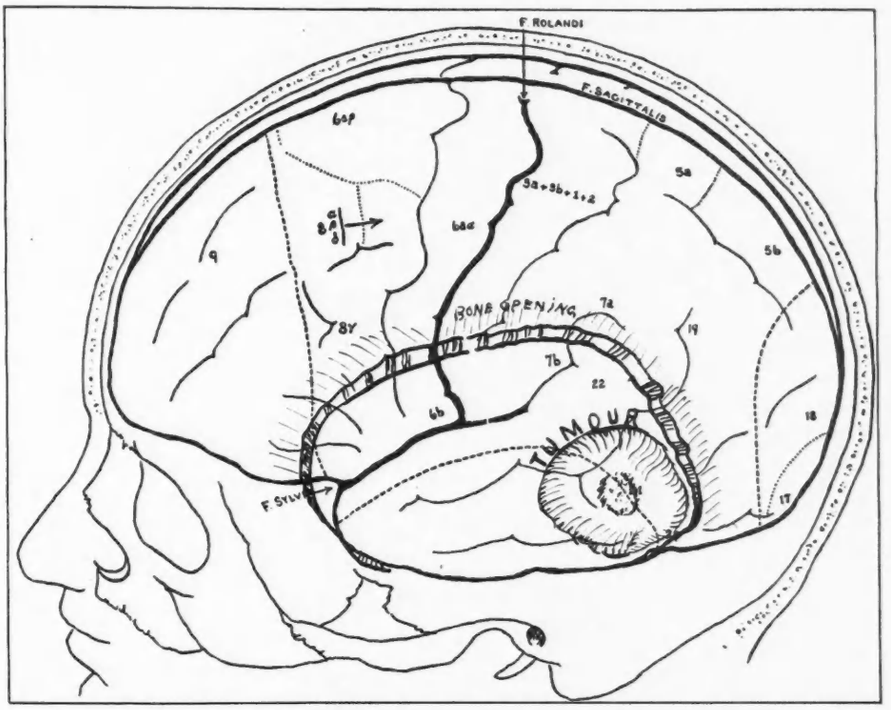

FIG. 1.—Sketch to indicate the size of the bone opening at the time of the myoplastic subtemporal craniotomy and the situation of the tumour as it presented on the surface.

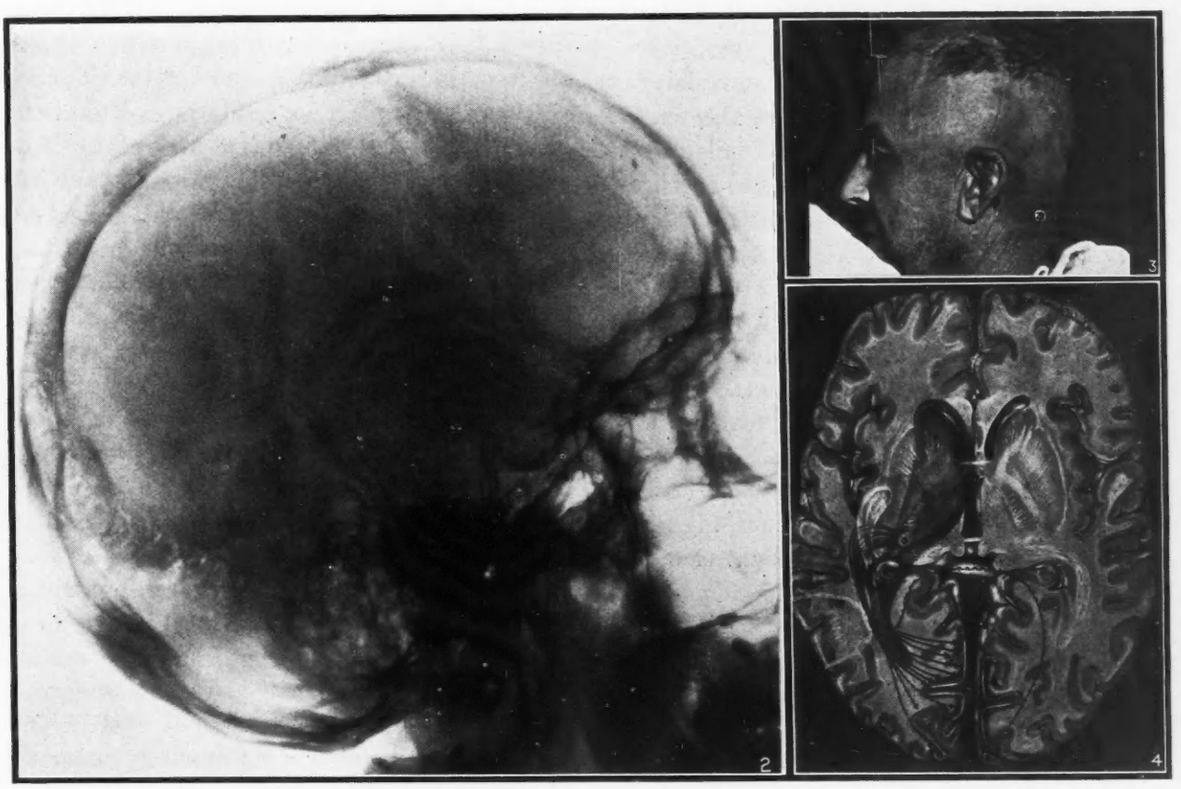

FIG. 2.—Lateral x-ray showing the depression and partial absorption of one anterior clinoid process.

FIG. 3.—The patient and the situation of the incision.

FIG. 4.—Schematic representation of the optic radiations from the geniculate body to the visual cortex. The fibres are shown curving around the inferior horn. The position of the tumour is drawn in as accurately as possible.

Epileptiform seizures.—The real reason for presenting this patient lies in his description of certain curious attacks which were only discovered after careful questioning. Each attack lasted for a few minutes up to half an hour and there was in each episode a regularly recurring march of phenomena as follows. First he heard a *roaring sound* which he described as continuous, and which seemed to him to come from one side or the other, so that he used to turn his head to see from whence the sound was coming. He said he knew that it was in his head, but instinctively he turned to look for the cause of the sound because it appeared to come from outside. Secondly, the roaring was followed by *dizziness*, so that he had to hold on to things and not infrequently he got down on all fours. Thirdly, there came *salivation*, so profuse that saliva ran from his mouth on to the ground. At such a time he stated "I felt as though I were going out". Fourthly, things began to *look small*, without seeming more distant. There seemed to be no change in the relationship of objects, but everything seemed to him quite small. As he began to recover, objects grew large again.

Although there was nothing convulsive in these attacks in the usual sense of the term, it was quite obvious that they were epileptiform. At such times he was quite unable to speak and it might be some little time before he would regain his usual speech.

To summarize, we were dealing with a middle-aged man who gave a short history of headache, diplopia, loss of memory, partial aphasia and recurring epileptiform seizures, characterized by the progressive appearance of a roaring noise, dizziness, salivation and micropsia. He was unable to speak, but never lost consciousness nor motor control. There was a shift of the pineal gland from left to right, a very slight emotional weakness of the lower right face, moderate aphasia, and right homonymous hemianopsia, with sparing of macular vision.

Operation.—A large myoplastic subtemporal craniotomy was carried out on the left side (Fig. 3). The dura was under very greatly increased pressure. In the posterior portion of the left temporal lobe was a reddish tumour, which presented on the surface over an extent of about 4 cm. (Fig. 4), and was somewhat bluish toward the centre. It was not clearly separable from the brain itself, and the fissure of Sylvius was pushed upwards. The tumour extended to a depth of about 3 or 4 cm. and was roughly round in shape. It was removed without entering the ventricle. The procedure was carried out under local anæsthesia, and the patient spoke at least as well at the end of the operation as at the beginning. Histologically, the neoplasm unfortunately proved to be a glioblastoma multiforme.

Post-operative recovery has been uneventful, and he has had a complete series of deep x-ray treatments applied to the whole head, and he will have two more series at intervals of from one to two months. The aphasia has nearly disappeared but there is still impairment in mental activity.

DISCUSSION

There were a number of interesting points in this case. First of all, the patient was a left-handed man who, without interference, learned to write with his left hand. It is fair to conclude that the speech function has not developed exclusively in the right hemisphere. Perhaps it is not represented at all there. Certainly some of the speech function is represented in the hemisphere which, by definition, is not the dominant one. We have seen one or two other instances of left-handed individuals whose speech function was still localized in the left hemisphere.

The x-rays are of interest in that the absorption of the left anterior clinoid was obviously due to the neighbourhood pressure from the tumour. Kornblum and Osmund,[3] in a recent publication, have shown that out of 446 cases of verified intracranial tumour the most frequent positive roentgen finding was alteration of the sella turcica, this being present in 65 per cent of the cases. I feel that the sella may often be looked upon as an intracranial indicator of the presence and position of a tumour. Change is produced in it by the proximity of the tumour, and absorption of the calcium in the sellar outline, including the clinoid processes, occurs in that portion of the sella which is nearest the tumour. The absorption must take place sometimes quite rapidly. Increase of pressure is thus not distributed through the brain to all parts of the cranial chamber equally. Because of resistance of the brain tissue the pressure is ever greater as the expanding lesion is approached.

The difficulty of hearing in this case brings up many points of interest also. Here is a man whose seizures begin with a roaring sound. It is reasonable therefore to assume that the neoplasm is impinging most intimately upon that part of the brain in which his hearing is represented. Is it reasonable also to suppose that the progressive "nerve" deafness which is present in both ears, and which has been most marked for the last few months, is due to in-

volvement of that part of the cortex in which hearing is represented? It is generally accepted that the bilateral representation of hearing makes any impairment as the result of a unilateral cerebral lesion impossible. And yet there may be some variability in the completeness and equality of such functional division that makes such a thing possible in one patient and not in another. Loss of memory and mental phenomena in general are far more frequent in my experience in tumours of the temporal lobe than they are in those situated elsewhere in the brain. The aphasia in this case calls for special study and a more protracted discussion than our time allows.

The homonymous hemianopsia is interesting because of the position of the tumour. Allen[1] showed that occipital lobe tumours not infrequently gave rise to a homonymous hemianopsia with sparing of macular vision. Horrax and Putnam[2] concluded that this was in general characteristic of occipital lobe tumours, whereas tumours of the temporal lobe produced a hemianopsia that was complete, with macular splitting. In the illustration (Fig. 4) the probable relation of the tumour to the optic radiations is indicated. We have concluded in a number of cases of occipital lobe amputation for focal epileptic seizures that there must be a tract for central vision which passes across to the other occipital lobe. For in those cases in which we removed all of the calcarine area there still was preserved macular vision on the blind side. Therefore there may well be a tract, as indicated in Fig. 4 by a succession of question marks, to the opposite occipital pole, bearing impulses which subserve central vision. In this case the pressure of the tumour upon the optic radiation may have been so far posterior as to allow this crossing tract to escape as it passes to the other side of the hemisphere, and this would indicate that the tract may well leave the radiations somewhat further anterior than drawn. When one has a working hypothesis it is necessary to weigh all accumulating evidence for or against it. The posterior position of this discrete tumour might well explain the escape of the above bundle.

Most interesting of all is the light thrown upon the localization of cerebral function by this man's description of his attacks. The roaring in the head must have arisen from an epileptogenic discharge in the cortex adjacent to the tumour. We have produced a drumming sound in conscious patients by stimulation of the third convolution of the temporal lobe. This has only been successful occasionally. Further, we have produced dizziness several times by stimulation of the temporal lobe in the second or third convolution. In the attacks of this patient the roaring sound was followed by dizziness and then by salivation. One may be at a loss to be sure in which direction the Jacksonian disturbance was spreading, but because of the fact that the fourth phenomenon is micropsia, which we would expect to arise from the visual association areas more posterior (area No. 19 or perhaps No. 18 in Fig. 1), it may be concluded that the salivation was produced by discharge in an area which lies between the posterior temporal convolutions and the visual association cortex. Further, as there were no sensory phenomena in the face it seems evident that the spread of cortical disturbance was not upward or forward but along the under surface of the temporal lobe backward and upward to the occipital lobe.

It is only by keeping the patterns of such attacks before us that we can hope to insert some of the unplaced pieces in the "jig-saw puzzle" of the cerebral localization of function.

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DISCUSSION

DR. MCNALLY: The cortical representation of hearing is bilateral, and this unilateral lesion should not have caused a loss of hearing.

DR. RUSSEL: Von Monakow stated that in parietal tumours the patient might not be able to describe his way from one place to another. In this case I wonder how much of the change is mental and how much of it is associated with the sensory aphasia.

DR. PETERSEN: Foster Kennedy attempts to explain aphasia in left-handed people with a left-sided lesion on the basis that they come from right-handed stock and that their speech centres are located in the left hemisphere. In a case previously studied here aphasia occurred with a left-sided lesion in a boy who was left-handed and whose mother and sister were left-handed. Are the confusional symptoms in this case like those which Dr. Penfield has described in cases of cerebellar tumour?

DR. ELVIDGE: Is the march of events linear or more likely, as in my opinion, circular? And consequently one could not postulate the site of such a symptom as salivation in this case.

DR. PENFIELD: Cerebellar tumour cases, especially after successful removal, are more apt to show signs of amentia rather than selective confusional symptoms such

as in this case. I think that the most marked mental changes which occur in cases of brain tumour occur in those in which the lesion is in the temporal lobe. In regard to Dr. Elvidge's question, the third phenomenon in the attacks of this patient was salivation and the fourth micropsia. One presumes that the spread was backward toward the visual association centres, and that therefore salivation resulted from a discharge in the brain posterior to the tumour. Although it is difficult to know the mode of advance of symptoms we seem to have evidence sometimes of a linear spread rather than a circular one.

BRONCHIAL STENOSIS IN PULMONARY TUBERCULOSIS

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BRONCHIAL stenosis complicating pulmonary tuberculosis and producing asthma-like symptoms is comparatively uncommon and even more rarely recognized. Eloesser[1] has recently called the attention of phthisiologists to the condition. McConkey[3] also has reported a case, and others are to be found in the literature. The two cases included here were recently observed on the Medical Services of the Saskatchewan Anti-Tuberculosis League.

Case 1

Mrs. P.W., stenographer, aged 24 years, was admitted on April 17, 1928, with a tuberculous lesion involving the middle two-thirds and the hilum of the left lung. She complained of cough, slight expectoration, and pain in the left chest. There was slight shortness of breath. The onset apparently had been three months previously with a "cold". She had had measles, mumps and scarlet fever; also influenza (1918) at 14. Adenoids had been removed at 15 years and the appendix at 18 years. There had been no asthmatic attacks. The family history was negative for tuberculosis and asthma.

On admission, physical examination revealed slight dullness over the left side of the chest and crepitations were heard over the same area. X-ray showed mottling about the root, extending outward and involving the middle two-thirds of the lung. There was a small area of fine, discrete densities at the tip of the second rib on the right side, which was interpreted as a healed lesion. Her temperature was normal. There was no difficulty in breathing or huskiness of voice. Tubercle bacilli were found in the sputum. The Wassermann reaction was negative. Left pneumothorax was instituted at once, and an excellent collapse obtained, although there was an adhesion in the apex. In June slight effusion developed, which subsided in September. Pneumothorax was continued. Fluid reappeared in September, 1932, which never entirely disappeared.

In January, 1932, examination by our oto-laryngologist was reported as follows: "Nose and sinuses normal except for excessive secretion from turbinates. Tonsils fairly healthy. Larynx normal." In May the patient was well enough to be allowed home on ten days' leave. She had no cough, and only one or two drachms of sputum daily (negative for several months). Slight shortness of breath on exertion was noticed at this time.

In April, 1933, the patient appeared to have come to a standstill and was very discouraged. The sputum was again positive. It was thought that after five years of such complete collapse the lung would never expand and that thoracoplasty would have to be performed eventually. Phrenicectomy was done as a preliminary measure. She had a rather severe gastric upset following the operation. In July the first complaint of shortness of breath and "wheezing" was entered on the charts. This was accompanied by pain in the right side. The second attack, lasting several days, was in August. The difficulty in respiration was mostly inspiratory. Adrenalin gave some relief, also ephedrine, which was used after the first day.

These attacks became more frequent and distressing. Three were rather severe ones in January, March, and April of 1934, the last continuing for almost the entire month. During attacks there was both inspiratory and expiratory stridor, the former predominating. The attacks usually terminated by the expulsion of considerable thick tenacious mucus. Between attacks she was comparatively comfortable, except for the "wheezing" respiration. There was a definite inspiratory stridor and expiration was prolonged. Induced alteration of the intra-thoracic pressures, either up or down from her usual levels, had no apparent effect. This was tried once during an attack with a similar lack of result. Atropine now gave more relief than anything else. Expectorant mixtures were tried, which noticeably facilitated expectoration. No attempt was made to desensitize with tuberculin. During the summer she became much worse, and died, August 17th, during a suffocative attack, in which she was cyanosed. The terminal event was a huge inspiration with inability to exhale. Artificial respiration was of no avail.

An autopsy was performed by Dr. G. R. Townsend, who reported as follows.

"On opening the thorax the heart was found to be retracted to the left. The left parietal pleura was greatly thickened. On cutting through it into the pleural space the left lung was found to be completely collapsed against the mediastinum and covered with thickened visceral pleura. There was a dense pleural adhesion from the apex of the lung to the upper part of the thoracic cage. The free pleural space contained about 100 c.c. of clear fluid. The right lung was large, voluminous and airy, and extended well over the midline. The thoracic organs were removed *en bloc*.

"On dissecting down the trachea to its bifurcation a small amount of muco-pus was exposed lying in the lumen. Just above the bifurcation was an area of constriction, the lumen being about 1/12th of an inch in diameter. The lumen of the right main bronchus was found to be completely occluded by thick tenacious muco-pus which extended into the lumen of the three lobar bronchi and down into their divisions. In the wall of the right main bronchus were several areas of ulceration and caseation necrosis, one triangular in shape, measuring 1 and ¼ of an inch in length and

¼ of an inch across the base. The basal bronchi were dilated to some extent and filled with the same muco-pus. On cutting into the right lower lobe, muco-pus and frothy fluid exuded from the bronchi. Two or three circumscribed areas of caseation necrosis were exposed. The middle lobe on section appeared relatively healthy. In the upper part of the upper lobe on section there was exposed a large circumscribed area of caseation necrosis the size of a tangerine orange. The left main bronchus was greatly thickened and its lumen narrowed to the size of a match. This was, too, completely occluded by muco-pus. On opening into the collapsed left lung it was found to be nothing but a sac of thickened pleura containing necrotic tissue and this same muco-pus. The left diaphragm was found to be thinned out in its central portion and to contain mostly fibrous tissue enclosed by serous membrane. Peripherally, there were some areas of muscle tissue, but these, grossly, had a degenerative appearance.''

Histological sections removed from the bifurcation of trachea and right main bronchus disclosed ''Tuberculosis, showing giant cells, caseation, necrosis, etc.''

CASE 2

Miss E.H., stenographer, aged 27 years, was first admitted on May 30, 1932, following the discovery of a minimal tuberculous lesion in the right apex. On May 13th, the left posterior cervical glands had been removed and found to be tuberculous. She had not been feeling well and had tired easily for about a year prior to this.

She had had small-pox, measles, mumps, scarlet fever and chicken-pox before her eighth year, and whooping-cough at ten years. There had been no asthmatic attacks. There was an indefinite history of exposure in 1928 to a boarder in her home who was later reported to have tuberculosis. The family history was negative for tuberculosis and asthma.

On admission, physical examination revealed only roughened breath sounds over the right apex. X-ray showed slight mottling above the clavicle, in the first two interspaces, and about the hilum on this side. Her temperature was normal. There was no difficulty in breathing or huskiness of voice. No tubercle bacilli were found in the sputum, which was very slight in amount, and the Wassermann reaction was negative. In July she was examined by an oto-laryngologist, following complaints of nasal obstruction with posterior discharge and a ''lump'' in the throat in the region of the larynx. The nose was reported as free from abnormality, but excessive secretion present. The lump in the throat was put down as ''globus hystericus''. The vocal cords and the interior of the larynx were normal. Her general condition improved, her weight increased from 102 to 107 lbs., and she was discharged in October of the same year to continue treatment at home. X-ray now showed the apical shadows to be discrete and suggesting considerable fibrosis.

On November 9th the patient reappeared at our clinic complaining of persistent cough and ''wheezes and clicks'', particularly on her right side. She was feeling well otherwise. Examination revealed rhonchi on both sides, but more on the right. X-ray showed no change from the condition on discharge. She was observed frequently after this. Cough and slight expectoration persisted. Her weight remained the same and she felt well. Crepitations were heard later over the right apex, and she was readmitted in January, 1933. The sputum was now repeatedly positive; the temperature, 99°. Examination on April 20th revealed well marked bronchial breathing over the right apex with numerous crepitations. X-ray showed a dense even haze above the right clavicle which had a sharply defined lower border, concave downward and curving to the hilum. This was interpreted as atelectasis involving at least part of the upper lobe and masking the areas of disease. No mottling was visible elsewhere. At this time there was no complaint of difficulty in breathing, but there were periodic attacks of ''wheezing'', suggestive but not typical of asthma. No huskiness of voice was noticed. She had had several attacks of right-sided pain around and below the clavicle, lasting two to three days. These were not accompanied by any constant symptoms and ended suddenly. In August some huskiness of voice was noticed. Laryngeal examination showed the cords to be normal, but the arytenoids were somewhat injected. There was no ulceration. Physical examination now revealed only roughened breath sounds over the right apex. X-ray showed clearing of the dense haze referred to, with only some hazy bands extending up from the hilum to the medial part of the apex.

X-ray examination in January, 1934, revealed recurrence of the atelectasis and mottling about the right root. Since the previous examination she had had two asthma-like attacks with laryngitis, and considerable bronchitis and difficulty in breathing. These were relieved by inhalations. Right pneumothorax was instituted at this time. It resulted in increase in the ''asthmatic'' symptoms and difficulty in breathing. Inhalations continued to give some relief. Films showed fair collapse, with a few adhesions in the apex. The dense haze in the apex had disappeared and the area was now comparatively clear. There was some new mottling near the periphery, opposite the hilum. The attacks of difficulty in breathing became more frequent, distressing and prolonged. Adrenalin did not relieve them. Inspiration was most markedly prolonged, and was rasping and difficult. In view of this pneumothorax was discontinued in June. Examination again by an oto-laryngologist revealed the cords to be normal in appearance and movements. Tracheal obstruction was looked for, but could not be seen.

Ephedrin was tried in the attacks and gave some relief. Atropine was tried on one occasion, with no apparent benefit. When the patient complained of inability to raise sputum she felt to be present an expectorant mixture was tried cautiously. It apparently facilitated expectoration a little. The difficulty in respiration became progressively worse, while ephedrin continued to give slight relief. In October her condition became serious. Breathing was very laboured and the accessory muscles of respiration came into play. Inspiration was extremely difficult and expiration somewhat rasping. She was obviously going down hill.

The patient died, October 29th, apparently of suffocation. The terminal event was inability to inhale. Just before death the respiratory sounds were markedly diminished over the right, and this side of the chest appeared fuller than the other. A post-mortem film showed absence of pneumothorax, mottling on the right in the first interspace, more dense in the second and third, and, again, about the root and along the lower vertebral trunks. There was a small localized area of mottling beneath the first rib on the left. There was no evidence of atelectasis.

Permission for a partial autopsy was obtained. On opening the chest, the right lung appeared enlarged and was adherent to the chest wall by numerous fibrinous adhesions and a few fibrous ones in the apex. The middle lobe was markedly enlarged and lighter in colour than the other two. The left was free, except for one fibrinous adhesion in the apex. There were no enlarged tracheo-bronchial glands. The trachea, heart and lungs were removed in one piece and the bronchial tree dissected from above.

The lining of the trachea was rough and corrugated in vertical folds. The cartilage rings could not be seen from the inside. Just above the bifurcation definite ulceration was present, involving the entire inner circumference, with constriction of the walls so that the lumen was not more than ⅛th of an inch in diameter. This ulceration continued into both main bronchi. Along the right there was a second constriction with the lumen even smaller. The right upper lobe bronchus was involved in

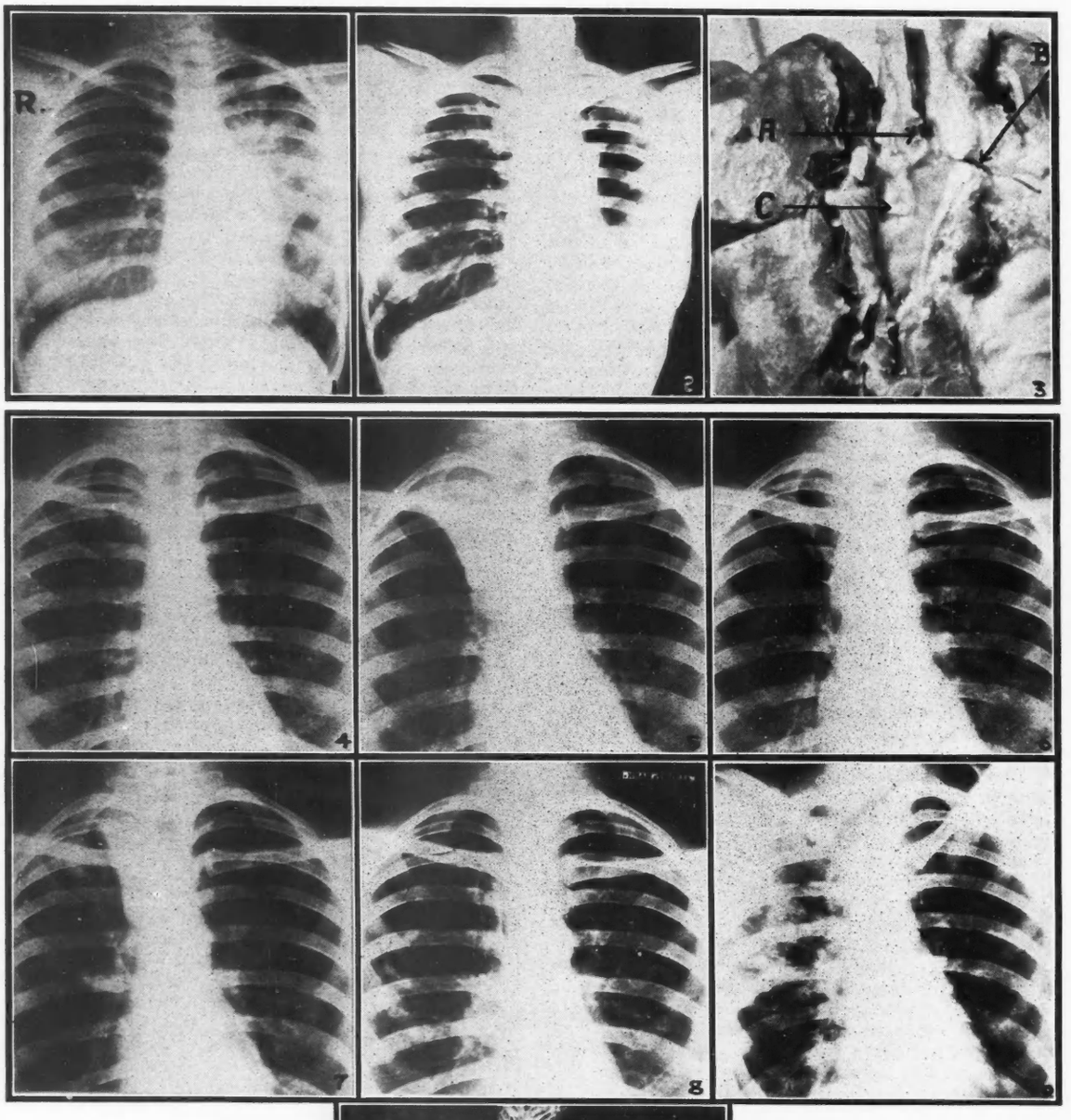

FIG. 1.—*Case 1.* On admission, April, 1928.

FIG. 2.—*Case 1.* May, 1933. Hydro-pneumothorax. None of the many films showed any significant difference from this.

FIG. 3.—*Case 1.* Hardened specimen. A—Stenosis of trachea (block removed for microscopic examination). B—Stenosis of left main bronchus. C—Area of ulceration and caseation necrosis in wall of right main bronchus.

FIG. 4.—*Case 2.* On admission, May, 1932.

FIG. 5.—*Case 2.* April, 1933. Atelectasis of right upper lobe.

FIG. 6.—*Case 2.* August, 1933. Almost complete aëration of atelectatic lobe.

FIG. 7.—*Case 2.* January, 1934. Recurrence of atelectasis.

FIG. 8.—*Case 2.* July, 1934. Pneumothorax established. Atelectatic lobe completely aërated.

FIG. 9.—*Case 2.* Post-mortem film, August, 1934. Spread throughout right lung.

FIG. 10. — *Case 2.* Hardened specimen. A—Stenosis of right main bronchus. B—Stenosis of trachea. Lumen at both constrictions does not appear as small as was actually the case. The area of ulceration extends downwards from the tracheal constriction, across the left main bronchus, down the right, and into the right upper lobe bronchus.

a similar ulcerative process. The lower bronchi on both sides were occluded with strands of ropy purulent mucus. Pea-sized and smaller tubercles were present in the upper part of the right upper lobe, in the tip of the middle lobe, and in the posterior lower part of the lower lobe. This lower tip was atelectatic. Some of these tubercles were caseous. There was also a large tubercle in the left apex near the lateral wall.

Histological examination confirmed the diagnosis of tuberculous ulceration of trachea and main bronchi. A specimen from the distended, light-coloured, middle lobe was emphysematous.

Eloesser's[1, 2] thorough clinical, radiological, bronchoscopic and pathological studies have thrown a great deal of light on these obstructive conditions occurring in tuberculosis. He follows the classification of v. Schroetter in grouping them as intra-mural, mural and extra-mural.

The intra-mural form is the rarest. It may occur in children when a peri-bronchial or peri-tracheal lymph node may suppurate and ulcerate through the bronchial wall, part of the node sloughing into the lumen. Mural processes are more common. They may be *ulcerative*, a caseous ulcer; *hyperplastic*, a submucous infiltrate, producing sufficient thickening to obstruct the lumen, or submucous tuberculous granulomata with hyperplasia of the submucous lymph follicles; and *shrinking*, in which fibrous scars may kink and distort the bronchi sufficiently to cause obstruction. Extra-mural processes include enlarged hilar lymph nodes and peri-bronchial sclerosis. The latter condition is also seen in syphilis. A more or less diffuse sclerosis of the smaller bronchi and bronchioles is also included.

Eloesser describes in detail tuberculous cases of various types. Two were of obstruction to the trachea. One was in an adult in whom the x-ray revealed a constriction about the middle of the trachea, with dilatation above and below. Autopsy revealed tuberculous ulceration (bacilli found) with much fibrous tissue at the site of stricture. There was emphysema of one lung and atelectasis of the other, with no evidence of pulmonary tuberculosis. The other case was in a child in whom a large solitary tubercle obstructed the trachea just below the thyroid cartilage.

Unilateral obstruction of a main bronchus or a single lobe bronchus occurs more frequently in tuberculosis. Eloesser gives particulars of several cases in which the obstructing stenosis was seen with the bronchoscope. These cases have considerable similarity to the two reported here. In some of them more extensive atelectasis was present.

McConkey's[3] case had obstruction at the lower end of trachea due to a fibro-caseous ulcerative lesion implicating the cartilaginous rings. The right main bronchus and some of its major bronchi were almost occluded with caseous material. Smaller bronchi were also thickened and occluded. There had been attacks of so-called asthma and laryngitis, with loss of voice and pain on swallowing. The respiratory difficulty here was chiefly on expiration. Coryllos,[4] in an article on atelectasis, cites two cases (Nos. 3 and 5) of proved bronchial obstruction in tuberculosis. In one a fibrinous plug was found at autopsy obstructing the right main bronchus; in the other, a cicatricial stenosis of a lower lobe bronchus was found bronchoscopically. He does not mention, however, any accompanying disturbance of respiration. Myerson[5] reports a case of pulmonary abscess with tuberculous thickening of the mucosa and ulceration of the bifurcation and right main bronchus, diagnosed by bronchoscopic biopsy. The patient had an attack of dyspnœa, inability to cough, chest pain, and a chill the night before admission. Packa·d[6] describes a case of old fibroid tuberculosis which came to autopsy in which obstruction was due to the main bronchus being "thickened and its lumen greatly compressed, its mucosal surface redundant and deeply injected". There had been an attack of dyspnœa, a feeling of weight and constriction, and productive cough, changed to non-productive two years before death. General health had been "fairly good" in the interval, with the massive collapse persisting.

The symptoms and findings in tuberculous obstruction are in general the same as in that due to other causes. In partial obstruction of the trachea or bifurcation affecting both bronchi simultaneously there is often extreme dyspnœa with a loud inspiratory stridor. The patient may complain of extreme suffocation. The trachea moves up and down with respiration. The chest tends to be barrel-shaped in spite of the retracted intercostal spaces. Complete obstruction of a main brochus produces less severe dyspnœa. It is not usually paroxysmal. There is often pain or a pulling sensation on the affected side. There may be no symptoms after the condition is established. Examination reveals contraction and immobility of the affected side, dullness, absence or marked diminution of the breath sounds, and shifting of the trachea and heart toward the side of the obstruction. The diaphragm is raised and relatively immobile.

Partial obstruction usually results in dilatation and emphysema of the affected side with the characteristic findings. Intermittent obstruction may be very puzzling, as the findings of emphysema and of collapse may reverse themselves from time to time. Eloesser states that these intermittent obstructions of a main bronchus are more often non-tuberculous. Coryllos[4] writes that partial obstruction causing emphysema is frequent in tuberculosis and sometimes "gives rise to true asthmatic attacks". Stenosis of a single lobe bronchus, producing atelectasis, may cause no symptoms of itself. Localized retraction and immobility may be observed. Dullness may sometimes be elicited. Absence or diminution of breath sounds is not constant. The x-ray is more definite, as the picture of an atelectatic lobe is characteristic. The radiological appearance of atelectasis of the different lobes is quite definite and well known. That of an upper lobe is described and shown in our Case 2. Collapse of the middle lobe gives a dense, sharply defined shadow, roughly triangular in shape, with the base of the triangle resting on the right border of the heart and the

apex toward the chest wall. The upper side is usually horizontal. Atelectasis of a lower lobe gives a similar dense shadow filling the cardio-phrenic angle and the upper border of which extends from the hilum to the costo-phrenic angle or to the chest wall a short distance higher up. In addition, depending on the lobe involved, the trachea may be drawn over but not the heart, and *vice versa*.

In obstructions below the bifurcation in tuberculosis the clinical picture usually has added to it the toxicity resulting from damming back of purulent secretions. Intermittency of symptoms was characteristic of our two cases. The stenosis is probably constant and the intermittency of symptoms due to recurrent blocking of the narrowed lumen with caseous debris or thick mucus. Intermittency of the atelectasis was noted in our Case 2. It had no relation to the dyspnœic exacerbations. After the first x-ray demonstrations of atelectasis a film was secured showing almost complete aeration of the affected lobe. Later, atelectasis was definite again, only to disappear after the induction of pneumothorax. The disappearance of atelectasis after pneumothorax in this case was probably due to "unkinking" of the affected bronchus.

Eloesser states that the diffuse sclerosis of the smaller bronchi and bronchioles is not on such a firm foundation as the other types described. This type is sometimes seen in the tuberculosis grafted on the silicosis of quartz miners, and in others. There is no intermittency of the symptoms. It is a diffuse tuberculous emphysema, due, in Eloesser's opinion, to a diffuse stenosing bronchiolitis. The dyspnœa may be severe, but is inspiratory, in contradistinction to true asthma, and there is no stridor. The findings are those of emphysema; resonance is increased, breath sounds diminished, inspiration prolonged, and rhonchi and râles are heard throughout the chest. X-ray sometimes shows peri-hilar increase in density. These cases have been described as tuberculous asthma, due to tuberculous allergy. However, most students of allergy are of the opinion that an asthma due to sensitivity to tuberculo-proteins does not exist.* There may possibly be a direct toxic action on the bronchial musculature by the products of the tubercle bacillus.

Cases of pulmonary tuberculosis with asthmatic dyspnœa have been observed in which relief of symptoms has followed desensitizing treatment with tuberculin. However, this cannot be accepted as proof of their allergic nature, as numerous cases of asthma, some of them tuberculin-negative, have been treated with tuberculin with beneficial results.[7, 8]

Diagnosis of these obstructions to the large or smaller parts of the bronchial tree may be made on the clinical picture described. The onset of asthma-like "wheezing" may be the initial event in the developing train of symptoms. X-ray is of great help and injection of opaque oil may reveal the site of obstruction, but its use is not without risk in tuberculosis. In many cases the radiological findings are inconclusive, particularly regarding an upper lobe bronchus, and bronchoscopy remains the only way to confirm the diagnosis ante mortem. The lumen of the trachea, the bifurcation, the main bronchi and some distance along the single lobe bronchi, including those of the upper lobes, can be visualized by this procedure. Clerf[9] states that pulmonary tuberculosis is no bar to bronchoscopy when otherwise indicated.

Treatment of these stenotic complications is as yet mostly symptomatic. Adrenalin was no help in our cases. Ephedrin and atropine gave relief most consistently. Opiates to control cough were helpful. Oxygen by nasal catheter may be of some use. In cases of extreme cyanosis depletion by bleeding has been recommended. Heliotherapy and x-ray treatment are useful in reducing enlarged mediastinal glands. Expectorant mixtures, if used at all, should be tried with caution, as a suffocative attack might be precipitated. They were tried in both our cases with noticeable effect in one, and slight, if any, in the other. Eloesser states that in unilateral stenosis placing the patient on the good side in the hope of securing postural drainage is likely to provoke an attack, while putting the affected side at rest by placing the patient on it will often tide over an exacerbation.

Collapse therapy is of doubtful advantage. If it results in closure of a partially obstructed major bronchus with the damming back of septic secretions it will do harm. On the other hand, in the non-toxic patient whose obstruction is due

* Personal communication from Dr. R. M. Lichtenstein, of the Chicago Municipal Tuberculosis Sanitarium, and the Allergy Clinic, Rush Medical College, Chicago.

to sclerosis and shrinking, and where symptoms are mainly the result of the mechanical derangement of the thoracic organs, it may do good. In the case of obstruction to a single lobe bronchus collapse may also dam back purulent material or occasionally straighten sclerosed and kinked bronchi, clearing the obstruction. This latter probably occurred in our Case 2. Rest, mental and physical, and life in a warm, dry, equable climate without wind or dust, and at a low altitude is desirable. At present there is not much else to suggest for these patients. Bronchoscopy in the future may have something to offer. Removal of the caseous debris of an ulcerating gland and aspiration of the cavity may be done, and may be all that is necessary. The idea of repeated dilatation of the constrictions would not appear to hold much promise for permanent benefit,* while removal of debris and tenacious mucus should give temporary relief. Other methods of attack would seem as yet a subject for speculation and a challenge to medical ingenuity, but it is to be hoped that further study in our tuberculosis institutions will result in the development of new procedures and something useful in the way of treatment of these distressing complications.

From what has been presented it appears probable that many of the so-called "tuberculous asthmas" are in reality cases of complicating bronchial stenosis. And further, it would appear that bronchoscopy should have a place in the armamentarium of phthisiologists, as it already has in the hands of others specially interested in the various non-tuberculous disorders of the lungs or bronchi.

* Since this article was submitted for publication Werner (*Am. Rev. Tuberc.*, 1935, **31:** 44) has reported a case in which repeated bronchoscopic dilatation of the constriction was followed by considerable improvement.

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EARLY PROTECTED WEIGHT-BEARING IN THE TREATMENT OF FRACTURES OF THE FOOT, ANKLE AND LEG*

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IN the treatment of fractures of the long bones and of fractures about the joints certain *desiderata* are to be hoped for. In so far as possible, anatomical reposition of the bones should be accomplished. This necessitates, among other things, early reduction following the injury. In order that immediate interference may be carried out a well constituted fracture team is a necessity; in order that the procedure may be adequate, special training, including, *inter alia*, a knowledge of the mechanism responsible for the production of typical fractures, is imperative. Even more important, however, than replacement of the bone fragments in a normal position is the return to activity of the limb as a whole within as short a period as possible.

At the present time, among those surgeons who are particularly interested in the treatment of injuries of the extremities there is an argument with reference to the better method of permitting function, particularly in the case of the lower extremity. I believe I am correct in stating that the great majority of surgeons interested in fractures are of the opinion that the simple fixation of the injured limb in plaster of Paris, and the discharge of the patient from hospital, in order that he may move about with the help of crutches and with the limb dangling, is not followed by sufficiently favourable results to justify its employment as a method of choice. Of those who believe that early re-establishment of function is necessary, some, as for instance Robert H. Kennedy,[1] of the Beekman Street Hospital in New York City, advocate the employment of a fixation apparatus which is demount-

* From the Montreal General Hospital.

able, and which, in consequence, permits of early employment of physio-therapeutic measures and, more particularly, active joint movement. That such a technique does result in improvement in the nutrition of the part and in the avoidance of late joint stiffness is admitted; at the same time, we are of the opinion that, in so far as the lower extremity is concerned, the most important function is weight-bearing, and that the earlier in the course of treatment that weight-bearing may be re-established, the better the result ultimately obtained and the shorter the period of disability. It has, therefore, been our aim to arrive at a technique whereby early protected weight-bearing upon the injured limb may be brought about.

Granted that adequate bony union without disabling deformity occur in a limb, the second important group of functions to be observed are those of joint movement and muscle strength. I believe that experience has proved that interference with joint function is less likely to occur in fractures of the lower extremities if the patient be permitted, or urged, to walk upon the injured limb, even though the protective apparatus does not, in fact, permit joint movement. At the same time, the examination of patients whose limbs have been used, even though encased in plaster, compared with others who have suffered similar lesions but have been confined to bed or a wheel chair, or have walked with crutches while the affected limb remained dependent, will prove that muscle atrophy in the former class of case is strikingly less marked than in the latter. It would appear evident that, in addition to improvement in blood supply and consequent more adequate nutrition, an automatic functioning of the muscles of locomotion takes places, even though the bones to which the muscles and tendons are attached are not permitted to move.

Among the more common untoward complications and sequelæ which occur following fractures are: (1) delayed, or, in rare cases, non-union; (2) prolongation or permanence of interference with joint function; (3) contractures, and consequent interference with the action of muscles and tendons; (4) circulatory disturbance, manifested by swelling and loss of tolerance to low temperatures; (5) pain upon weight-bearing, due to atrophy of bone and ligamentous structures (Sudeck's atrophy).[2]

I am of the opinion that, granted adequate reduction has been obtained, the above group of unfavourable developments may be avoided, or at least their incidence and severity lowered, following fractures of the foot, ankle and leg, by a method which permits early weight-bearing.

HISTORICAL

Apparently the first attempt to permit early protected weight-bearing in the treatment of fractures of the lower extremity was instituted by Owen Thomas in Liverpool. Thomas introduced the splint or caliper which is used today as early as 1882. During the latter part of the last century a few surgeons in Germany, Austria and in the United States attempted to popularize the employment of plaster of Paris, applied without padding to the limb, in order to permit early weight-bearing. Of these recommendations, that of Dollinger,[3] of Budapest, who described his technique and reported 3 cases in 1893, was probably the basis of the other methods, and is, as a matter of fact, similar to that which has been used by the author. This early use of unpadded plaster in order to permit weight-bearing did not meet with unqualified support, even from those who seriously attempted to use it.

During the War, as the result especially of Sir Robert Jones' repopularization of Owen Thomas' methods and the aggressive campaign instituted by Meurice Sinclair, the Thomas walking caliper and the short caliper, carried to the upper border of the tibia, became very generally used. For the short caliper either one or two lateral bars were employed, depending upon the apparent necessity for protection.

THREE MODERN METHODS

During the past fifteen years, in at least three clinics treating large numbers of fractures techniques have been developed which have made it possible for patients suffering from—(*a*) fractures of the bones of the leg, (*b*) fractures in the neighbourhood of the ankle joint, and (*c*) fractures of one or more bones of the foot,—to commence walking upon the injured limb a comparatively few days following injury. In each of these three clinics the method has, I believe, been arrived at independently, although practically simultaneously. The three clinics referred to are those of Delbet[4] (1915) and Girode[5]

at the Hôpital Cochin in Paris, of Boehler[6] at the Unfall Spital in Vienna, and our clinics[2] at the Montreal General* and Western Hospitals.

The three methods have two important features in common. All apply plaster of Paris to the limb, which has been rendered free from swelling, without padding between the plaster and the skin. All three clinics take advantage of the fact that the upper end of the tibia is shaped like an inverted cone and that the tissues overlying it are well adapted to weight-bearing. Delbet's method, more especially, depends, in addition, upon the fact that the bony structures immediately above the ankle joint have, in general, the shape of a cone standing upon its base.

Delbet's technique.—As is well known, Delbet fixes plaster bars to both lateral aspects of the leg. These bars are attached in such a fashion, by means of cuffs encircling the limb both above the ankle joint and below the knee, that pressure exerted from below upwards upon the inferior surface of the tibia is transmitted by the plaster bars to the cuff, which is moulded accurately to the upper expanded portion of the tibia. Since the surgeons of France have long been accustomed to employ moulded plaster of Paris rather than circular bandages, such as are more commonly employed on this continent, Delbet prepares his apparatus by the former technique. In our clinic an adaptation of Delbet's apparatus has been used as a support during convalescence for fractures of both bones of the leg after union has become firm, but before it is deemed advisable to subject the limb to strain. For this purpose circular bandages are placed above the malleoli and about the expanded upper border of the tibia. These two cuffs are joined by two plaster bars. For each of the cuffs, one six inch five yard bandage is employed, and for each of the bars a similar bandage, moulded in strips and then doubled upon itself from side to side.

The following is quoted from the small book, "Les Fractures", by Charles Girode,[5] a member of Professor Delbet's staff. In speaking of their treatment of fractures of both bones of the leg, he says:—

> "Delbet's technique consists essentially, after reduction, in replacing the tibia which has been broken with two lateral rods which transmit directly the weight of the body from the upper epiphyses (tuberosities) to the corresponding malleoli; when properly applied these rods allow freedom of movement to the knee and to the ankle joint. They allow also early walking, but this is only an accessory advantage of the method".

With the former statement I agree; with the latter I take issue in that I am of the opinion that the early walking which is permitted by Delbet's technique is of more importance than the fact that the joints are not immobilized. At the same time, I do not believe that the incomplete cast obtained by Delbet's method is as useful as a means of permitting protected weight-bearing as a circular cast which includes the foot.

Boehler's method.—In all the fractures of the bones of the leg, about the ankle joint, and of the foot, Boehler applies plaster of Paris as a posterior moulded splint, with a circular cast superimposed without padding. Not only does he refrain from the use of padding but he applies the plaster directly to the skin without the application of any ointment to the latter. As a rule after the plaster is dry, but occasionally as soon as it is set, he applies to the lower portion of the cast an iron stirrup which is moulded to fit the surface of the cast accurately, and projects below the cast a distance of about 2 centimetres. He insists that it be understood that the use of the walking stirrup is not to take the weight off the fracture line, but to protect the heel of the plaster from injury.

He insists that if the position has been good, and if the patient has cooperated by walking each day, the leg following the removal of the cast shows little atrophy of the skin, muscles or of the bones.

After the final removal of the plaster, Boehler supports the limb by means of a zinc oxide gelatin paste dressing which is incorporated in a gauze bandage extending from the toes to the knee. Although younger people usually require such a bandage for but a short time, it is useful in older people and, he says, may be profitably employed for five or six months.

The author's technique.—At our clinics the treatment of all fractures of the bones of the foot and ankle joint is carried out by a definite technique. After a preliminary fixation period* of from two to twelve days, following reduction of the fracture — during which time disappearance of swelling of the limb is brought about,

*"L" Service (Professor E. M. Eberts), the Montreal General Hospital.

*As a routine the "pillow splint" is employed for this purpose.[2a]

chiefly by posture, assisted in some cases by baking and gentle massage — one layer of snugly fitting stockingette or a discarded silk stocking† is placed over the limb from the tips of the toes to the knee. The limb itself is previously carefully washed with soap and water, bathed with alcohol, and rubbed with zinc stearate powder. If bullæ have been present they are treated as indicated, and their neighbourhood painted with mercurochrome solution. Care is taken that no wrinkles appear in the stockingette (if such material be used), particularly in the neighbourhood of the ankle. Circular plaster of Paris bandages are then applied to the limb without the application of padding. Unusual care is taken in the application of the circular cast that no dead spaces exist beneath it, and, above all, that no constricting bands of plaster are applied. Before the cast has set it is carefully moulded about the malleoli and to the upper end of the tibia. The foot is fixed at a right angle at the ankle joint; pressure upon the inner and outer border of the foot is maintained, depending upon the nature of the injury; and the mid foot is flexed so that the first and fifth metatarsal heads are on the same plane.

Since it has been noted that the majority of patients wearing artificial limbs for amputations through the leg prefer to have some of their weight borne upon the lower border of the patella, and since the upper portion of the plaster cast is, in fact, to be employed in the same manner as the bucket of an artificial limb, the cast, in cases of fracture of the foot and ankle, has been carried up so as to fit the lower border of the patella in front. The posterior border of the upper end of the cast is cut away sufficiently to permit flexion of the knee to a right angle. The author has made it a practice to include the fifth and usually the fourth, toes in the plaster, as painful pressure points are thus more surely avoided.

In the application of the plaster cast the fact that the weight of the patient is to be carried from the heel of the plaster to the upper border of the tibia is borne in mind, and special care is taken to provide sufficient strength in order that this may be carried out. In my experience, the weak points of the plaster are the lower surface of the heel, across the anterior border of the ankle joint, and about the junction of the middle and lower thirds of the leg. These parts may all be strengthened by loops of plaster carried around the heel to about the middle of the leg.

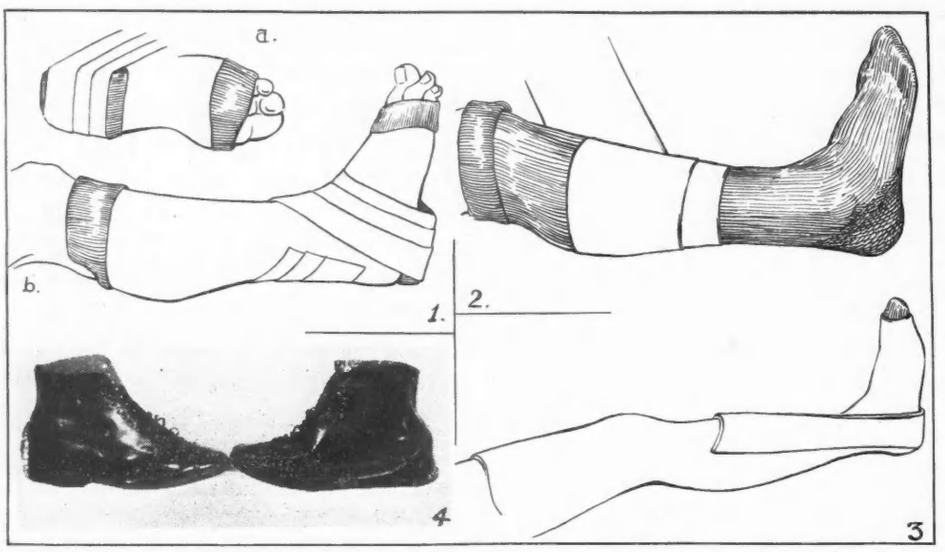

FIG. 1.—Below knee, unpadded plaster of Paris cast, showing felt heel fixed in position with adhesive plaster. Note that the 4th and 5th toes are covered. (*a*) View of sole. (*b*) Lateral view.

FIG. 2.—Silk stocking on limb; plaster of Paris circular bandage commenced.

FIG. 3.—Unpadded plaster of Paris extending up thigh, for fractures of both bones of the leg. Re-enforcing plaster, extending above fracture line, is indicated.

FIG. 4.—Two models of custom-made boots, made to go over walking plaster. Note that the lacing commences close to the tip of the shoe. The type without heel on the shoe is, I believe, the better.

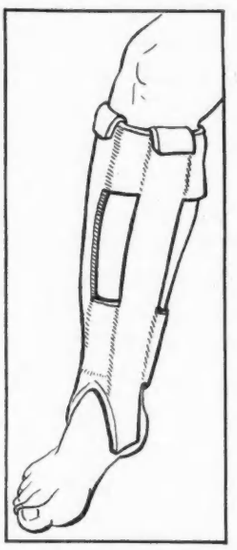

FIG. 5.—Modification of Delbet's apparatus, as used at our clinic, as convalescence fixation in fractures of both bones of the leg.

† These are always available in sufficiently large numbers from the waste baskets in the Nurses' Home, and are now used as a routine.

So soon as the plaster of Paris cast is dry, that is usually the day following its application,* a saddler's felt heel, one or one-and-a-half inches in thickness, is fixed to the sole of the cast by means of adhesive plaster.

The patient commences walking at once, preferably without the help of either crutches or stick. Some form of covering, not made of rubber, is recommended to encase the plaster and protect it from moisture. The length of time during which the walking plaster is worn will depend upon the severity of the original injury and the bone or bones involved. In the case of the less severe fractures about the ankle joint, firm union may be expected and rapid return of joint and foot function following removal of the plaster approximately six weeks following injury. At the same time, I am of the opinion that it is better to err on the side of too long protection, rather than to risk too early weight-bearing. Consequently, I feel that, except in the most trivial type of external rotation fracture of the lower end of the fibula, it is advisable to allow the patient to wear the plaster cast for a period of at least eight weeks.

In the case of fractures of the astragalus and os calcis, I believe it is rarely advisable to permit unprotected weight-bearing in less than three months following injury, and if the original trauma has been at all severe, four to six months may well be allowed to elapse. Since the patient is able to move about easily in the interval, and since swelling and stiffness are largely eliminated by the technique recommended, there is less objection to prolonged fixation than were a method used which required any considerable length of time before the re-establishment of function following removal of the plaster.

In the treatment of fractures of the metatarsal bones and of the great toe a similar technique is employed. Unless deformity is such that some special form of reduction is indicated, after a sufficient period of rest to permit swelling to subside, an unpadded plaster, which in this case extends beyond the toes and may well be made to cover all five toes and reach to the upper border of the tibia, is applied. The author feels convinced that, although this method of treatment may at first sight appear cumbersome for limited injuries of this nature, the period prior to return to work is lessened thereby, and, in the second place, unfavourable sequelæ such as swelling, joint stiffness, and acute bone atrophy are avoided.

In cases of great toe fractures, a period of active walking for six weeks usually suffices, and as a rule within a very short time after removal of the plaster the patient is able to return to work. In the case of fractured metatarsals, the ordinary patient is able to walk without any great difficulty after wearing the plaster for a period of about two months. Within one month thereafter it is usual for the workman to return to work.

In the treatment of fractures of both bones of the leg the method employed differs from that used in the case of fractures of the bones of the foot or about the ankle joint. Reduction, as promptly as possible following injury, is accomplished by means of traction, using for this purpose either a modification of the Delbet sling or skeletal traction with Kirschner wire or wires. A thin layer of padding is applied from the toes to the middle and upper border of the thigh, and over this a circular plaster of Paris cast is applied, care being taken to mould the plaster accurately over the bones below the knee joint and above the ankle joint. In difficult cases two wires are used, one through the upper border of the tibia, and one through either the os calcis or the lower end of tibia and fibula. By means of the two wires traction is exerted in two directions. The projecting ends of the wires are incorporated in the plaster, thus certainly maintaining length of the limb.

As is well known, it is usually impossible to place the foot at right angles to the leg in cases of fracture of both bones of the leg without producing posterior bowing at the site of fracture; consequently, it is usually necessary to fix the limb in the preliminary plaster in a position of more or less marked talipes. Such preliminary fixation is allowed to remain undisturbed for a period of from eighteen to twenty-four days. During the latter part of this period the foot of the bed is elevated by eight or ten inch blocks, and about the time when it is expected that fixation of the bone fragments will have commenced the cast is bi-valved, in order that inspection may be carried out and baking and light massage employed. At the same time the

* Drying of the plaster is hurried by the employment of a baking machine.

patient is urged to actively attempt to dorsiflex the ankle joint.

So soon as it becomes evident (about three weeks from date of injury) that sufficient stability of the limb is exhibited so that it may be handled and the foot brought to a position of a right angle with the leg an unpadded plaster of Paris cast is applied over a silk stocking. This cast reaches from the junction of the middle and upper thirds of the thigh down to the toes, and includes the fourth and fifth toes. The knee is fixed in full extension and the ankle joint at a right angle. The mid foot is flexed so as to re-establish the longitudinal arch. As in the case of fractures of the ankle, special care is taken to reinforce the bottom of the heel, the ankle joint region, and the leg to well above the site of fracture. As described in considering the treatment of fractures of the ankle joint, a one or one-and-a-half inch saddler's felt heel is fixed to the bottom of the heel of the plaster by means of adhesive strips. The patient is then urged to walk. During the first few days, as a rule, he will prefer to carry part of his weight on crutches, but as soon as possible he is advised to dispense with either crutches or cane and to bear full weight upon the injured limb, at least while walking indoors.

Although moderately firm union often appears to have taken place approximately two months from the date of injury, I am of the opinion that it is never wise to assume, except in children, that union of fractures of both bones of the leg will have consolidated sufficiently in this length of time to permit unprotected weight-bearing. I prefer to treat all patients in a long circular unpadded plaster for at least three months from the date of injury, and in many cases a longer period is evidently required.

When clinical and radiological examination appears to indicate firm consolidation, I have made it a practice to remove the long plaster, immobilizing as it does knee, ankle and foot joints, and to replace it by a protective dressing of the Delbet type. The Delbet plaster is worn by the patient until such time as long distances can be walked without fatigue, and until it is judged advisable to permit the patient to return to work. (Fig. 5).

Custom-made boots.—Private patients have been advised to purchase custom-made boots, so fitted as to go over the plaster. Such boots are usually so fashioned that they are not particularly noticeable, and consequently the patient is able to go about his business without being conspicuous. These boots have been made both with and without heels. If a heel be applied to the boot the felt heel is not fixed to the plaster. In general, I am rather of the opinion that it is advisable to supply the felt heel, and to have the boot made without a heel of its own. In Montreal, the cost of such a custom-made boot is between $10.00 and $12.00. For patients who cannot afford such a luxury, a cheap slipper-like covering can be made for $1.00 or thereabout. Hospital patients provide themselves with either the cheap slipper-like covering, a large moccasin, or a large overshoe. In general, it is inadvisable to allow the patients to wear a rubber over the cast, since the moisture which accumulates under these conditions is likely to soften the plaster. (Fig. 4).

DISCUSSION

Since the Autumn of 1918 I have employed the method recommended in this contribution as a routine in the treatment of (1) fractures of both bones of the leg, exclusive of those involving the knee joint; (2) all fractures of the ankle joint; and (3) all fractures of the tarsus and metatarsus; as well as (4) fractures of the great toe and occasionally of the smaller toes. I have had no occasion to regret the use of the technique in any one case, and in a number of cases which had not been progressing favourably improvement has been noted soon after the application of the walking plaster. One case only of non-union has occurred, and but one of acute bone atrophy.

TABLE I

	Days
Both bones of the leg	18 – 25
Ankle joint — seen immediately following injury (before swelling)	1 – 3
Ankle joint — seen after swelling has taken place	5 – 8
Os calcis — (reduction usually 3rd to 8th day)	10 – 16
Astragalus — (astragalectomy for crush fractures)	5 – 16
Mid-tarsal row — (cuneiforms, cuboid and scaphoid)	5 – 8
Tarsal bones	2 – 8
Great toe	1 – 8

The above Table shows the usual time, following injury, that patients are able to commence walking without crutches or cane with

protected weight-bearing upon the injured limb.

It is unusual to find patients who are unwilling to cooperate. Nevertheless it is frequently the case that a certain amount of education is required in order to induce the patient to commence weight-bearing. Many are fearful that pain will be suffered, and, as a matter of fact, not infrequently a certain amount of discomfort is noted during the first few minutes after weight-bearing is instituted. Among private patients objections are almost unknown, and the fact that the business man is able to return to his office without a crutch or stick within three to five days of injury of foot or ankle is usually greatly appreciated.

If a satisfactory brand of plaster of Paris be employed, and the application of the plaster be carried out in accordance with the method advocated in this contribution, the apparatus is moderately durable. The length of time which it will last is dependent, of course, upon the weight of the individual, and the amount of walking he does. As a general rule, it is possible to apply a plaster which will be useful for from six to twelve weeks. When the necessity for replacement arises, I have made it a practice to place the patient in bed for one, two or three days, in order that hot applications and active movements may be carried out. In this connection it is absolutely essential that bed-rest between applications of plaster be absolute, as otherwise a certain amount of swelling may take place. At the risk of too frequent repetition, it cannot be too strongly urged that the limb must be free from œdema at the time the unpadded plaster is applied.

The chief objection to the technique recommended in this paper is that, with few exceptions, the patient must be admitted to hospital, or be so located that treatment can be carried out in his or her own home. Except for the occasional case which is seen prior to the development of swelling, bed-rest with suitable support and posture must be available for a few days until all interstitial fluid in the affected limb has been dissipated. The absolute necessity of refraining from the application of unpadded plaster until all swelling has disappeared cannot be too strongly stressed. At the time, too, it may again be urged that weight-bearing should not be attempted upon a fractured limb encased in plaster applied over even a thin layer of padding.

Although the walking apparatus is somewhat cumbersome in appearance, and the patients usually complain for a few days at least that it is heavy, they become accustomed to the extra weight comparatively quickly. As a matter of fact, the walking plaster applied below the knee weighs from between two and one-half pounds to a little less than five pounds, depending upon the size and weight of the individual. Although the longer plaster required in fractures of both bones of the leg weighs slightly more, it will be seen that, as compared with the weight of the limb as a whole, the increased weight due to the plaster is, in fact, negligible.

The objections to Delbet's type of plaster for immediate treatment of fractures about the ankle or of both bones of the leg, are that (*a*) the fixation of the plaster is less adequate than by treatment in accordance with either Boehler's or the author's technique; (*b*) swelling is permitted, and does, in fact, take place; (*c*) due in large measure to the swelling, pressure sores in the neighbourhood of the heel, over the anterior tibial tendon, and about the edges of the two windows, more especially at the front of the leg, made by the plaster are difficult to avoid.

It will be noted that there are but minor differences in the technique employed by Boehler and myself. As a matter of fact, except for the fact that padding beneath the foot has been eliminated by both, Dollinger's method forms the basis of both Boehler's method and my own. The steel stirrup employed by Boehler does not permit a shoe to be worn, nor does it, I believe, protect the plaster more efficiently than the felt heel. Patients who have worn both appliances are unanimously in favour of the felt heel.

SUMMARY

The relative importance of the two forms of function of the lower extremity, namely, mobility and weight-bearing has been discussed, and the author's belief that weight bearing is of most importance in the prevention of untoward complications and sequelæ has been indicated.

The methods introduced by Delbet and Boehler have been outlined, and the author's technique for permitting early weight-bearing in

the treatment of fractures of the foot, ankle and leg has been described in some detail.

The advantages claimed for the method described are:—

1. Improvement in the ultimate result of treatment.

2. Shortening of the period of temporary disability.

3. Avoidance of untoward sequelæ—joint stiffness, muscle atrophy, persistent swelling and acute bone atrophy.

4. Relative elimination of the period of total temporary disability in the case of office workers and housewives.

5. Economic saving in hospital days or attendants' services.

The disadvantages are not serious, and consist of the following:—

1. The impossibility of treating those with fractures of the foot and ankle as office or out patients.

2. The greater skill required for the application of plaster.

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THE COMPARATIVE TENDENCY OF KRAUROSIS AND LEUKOPLAKIA OF THE VULVA TO BECOME MALIGNANT*

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THERE are five pathological conditions occurring upon the vulva whose appearances are confluent. These are vulvitis, syphilis, kraurosis vulvæ, leukoplakia and squamous carcinoma. An intimate study of these should be carefully carried out, because the incidence of carcinoma following upon leukoplakia is much greater than that in kraurosis or inflammatory conditions. The blood Wassermann test will practically exclude syphilis.

In our clinic during the last eight years we have had 17 cases of carcinoma of the vulva, 14 of which were sectioned and treated. Four of these showed a definite origin in leukoplakia. The chief clinical symptom in all cases of leukoplakia was pruritus; whereas in kraurosis the chief complaints were of dyspareunia, soreness and bleeding; and in carcinoma of a tumour of the vulva, with pain and bleeding.

What are the fundamental gross characteristics of these four remaining diseases? First, let us eliminate the true inflammatory lesions, as acute vulvitis, which shows swelling, softness and redness and occasionally a purulent secretion. Chronic vulvitis takes the form of a diffuse hypertrophy or overgrowth of the papillary bodies, occasionally producing papillary condylomata and leukoplakic areas. Carcinomata of the vulva present the characteristics of skin cancers, namely, a hard, flat, wart-like growth which in its later stages produces a suppurating and often excavating ulceration. The clitoris may become involved.

Leukoplakia prefers the outer surface of the labia majora and often spreads to the thighs and perineum. On the skin of the inner side of the labia majora and on the labia minora greyish streaks or spots occur. The skin becomes heaped like a callosity. The hair becomes erect, hard, brittle, and later falls out. Histologically, there is a widespread hard œdema about the papillary layer of the cutis, which may extend to the stratum reticulare and to the connective tissue below it. The epidermis shows a hypertrophy in the germinal layer, with papillary downgrowths into the deeper tissue. Lymphocytes are numerous in the underlying connective tissue about these

* Read before the Montreal Medical Chirurgical Society, January 4, 1935.

projections. The prickle-cell layer of the epidermis shows extensive thickening, with a hyperkeratosis above it. This produces a marked thickening in the stratum corneum, often to ten times its thickness. Pigmentation is occasionally demonstrated in the germinal layer of the epidermis. If there is a rich blood supply to the cutis a bluish-white coloration is seen, but if hyperkeratosis is marked the surface is whitish because the blood vessels cannot be seen through it.

Kraurosis vulvæ is usually a disease of the menopause or of the post-menopausal age. Occasionally it occurs in younger women. After a previous short inflammatory hypertrophy there is a gradual flattening and atrophy of the clitoris, labia minora and majora, with narrowing of the vaginal orifice and shrinkage of the urethra. The mucous membrane becomes greyish, hard, flat. Eczema and small ulcerations may develop on the surface.

It is my belief that all cases of kraurosis vulvæ have a previous hypertrophic or leukoplakic stage, and if this hypertrophy is prolonged a progressive leukoplakia will develop which will go through the stages of metaplasia and cancer-formation. If, however, atrophy ensues the leukoplakia progressively gives rise to kraurosis, and the involved skin now becomes thinner and thinner, resembling parchment. The surface becomes dry, scar-like, brittle. The shrinkage in this cicatricial sclerotic tissue produces a stretching of the skin over the nymphæ. The latter may entirely disappear as may also the frenulum of the clitoris. The vestibule of the vagina becomes funnel-shaped, narrow, causing dyspareunia and pain upon examination, because the diseased skin is easily torn and fissured. Even a long walk, or defæcation, may cause fissuring of the surface.

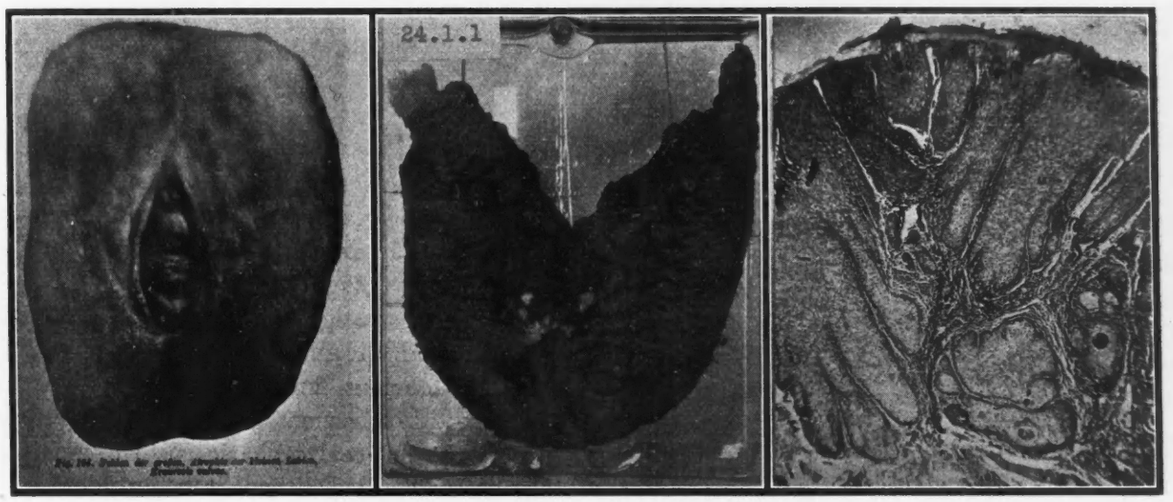

FIG. 1 FIG. 2 FIG. 3

FIG. 1.—Shows a typical picture of advanced kraurosis vulvæ. The line of demarcation between the labia majora, labia minora and clitoris is lost. The hair has fallen out. The surface is hard, brittle. The introitus is patent, funnel-shaped.

FIG. 2.—Shows a resected vulva and part of perineum. The surface is corrugated, leather-like. Whitish spots appear on the raised portions. Pruritus was a troublesome symptom.

FIG. 3.—A photomicrograph of a section from the vulva of a woman, 52 years of age, who had a resection of the perineum for leukoplakia three years ago. There is now a definite carcinoma at the fourchette.

Histologically, kraurosis shows an atrophy in all layers of the epidermis, especially of the stratum corneum and stratum germinativum. A complete loss of the papillæ of the cutis occurs, allowing the epidermis and cutis to lie in flat adjacent layers. In the stratum papillare and reticulare, in contrast to the œdema of leukoplakia, a homogeneous hyalinized material is seen which spreads diffusely throughout the subcutaneous tissue, fat, elastic fibres, hair follicles, glands of the hair follicles, sebaceous glands and sweat glands. These structures gradually disappear. If large sections are taken through the vulva these atrophic changes can be seen and connected with remnants of leukoplakic areas.

The clinical symptoms are characteristic of

the stage of the disease. In the hypertrophic, or leukoplakic, stage pruritus is a common symptom, but in the atrophic stage, or kraurosis, soreness and bleeding are the troublesome features. The symptoms of pruritus may be relieved by resection of the perineal nerves in the vulva, causing anæsthesia of the part, but this may obscure hypertrophic changes developing. Painting the surface with 5 per cent silver nitrate often gives relief. The administration of ovarian hormones may help. If the leukoplakic stage persists, however, a resection of the vulva should be done, as from 20 to 25 per cent of persistent leukoplakias will become malignant.

I am indebted to Mr. W. J. Plumpton for the technical study connected with this paper.

THE CLINICAL AND PATHOLOGICAL FEATURES OF A SERIES OF TWENTY CASES OF HODGKIN'S DISEASE*

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THE present paper, based upon an analysis of 20 cases of Hodgkin's disease, is added to the already voluminous literature on this disease in the hope of contributing something towards diagnosis, especially in cases where biopsy is either impractical or inadvisable. The cases studied are all those admitted to the wards of the Montreal General Hospital for the ten-year period from 1924 to 1934 in which a clinical diagnosis of Hodgkin's disease was confirmed either by biopsy of a gland or by autopsy. The literature has been consulted extensively, though for brevity only those contributions will be quoted which bring up controversial questions. The reader is referred to the comprehensive review by Fabian[1] who collected some 461 references up to the year 1911, and to Simonds,[2] who, in 1926, added an additional 180 papers.

The pathological history.—The pathological features of this series of cases are based upon a biopsy examination in 12 cases and upon a complete autopsy in 8. As regards biopsy, the criteria for diagnosis were the partial or complete replacement of the normal architecture of the lymph node by (1) some degree of fibrosis, (2) reticulo-endothelial hyperplasia or increase in endothelial cells, (3) eosinophiles, (4) mononuclear and multinucleated giant cells as described by Sternberg and, later, by Dorothy Reid. Thus condensed biopsy reports give the following figures: thickening of gland capsule, 5 cases; patchy fibrosis of the gland, 19; eosinophilia, 17; endothelial hyperplasia, 20; mononuclear or multinucleated giant cells, 20; microscopic necrosis of gland, 5; associated tuberculosis, 2.

Post-mortem findings.—Autopsy examination in 8 of the 11 patients who died under observation revealed diversified pathological pictures. The most obvious finding in all cases was the widespread involvement of the lymphatic tissues. Almost the entire lymphatic system, including the spleen, showed either gross or microscopic changes characteristic of the disease, and yet in only 4 of the 8 cases subjected to detailed histological study had infiltration of other organs or tissues taken place. The organs involved and their frequency of involvement were as follows: lymph nodes, 9 cases; spleen, 9; liver, 3; lung, 3; adrenal, 3; bone, 2; mesentery, 1; small intestine, 1; pancreas, 1; lacrimal gland, 1. The failure of the disease to infiltrate tissues other than the lymph nodes and spleen, even though the disease is widespread in these tissues, was well illustrated by two cases which were under observation for six years and two and three-quarters years respectively. On the other hand two other cases, under observation five years and two and a half years respectively, and subjected to similar clinical treatment, showed widespread metastases. Furthermore, the malignancy of the process from a clinical standpoint was not always indicated by the appearance of the histological sections.

The cause of death in the 11 patients who died under observation was bronchopneumonia in 3; congestive heart failure, 4; pulmonary

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hæmorrhage, 1; *Staphylococcus aureus* septicæmia, 1; and acute tuberculosis, 2.

Tuberculosis and Hodgkin's disease.—The association of tuberculosis with Hodgkin's disease has long been of interest from both pathological and etiological aspects. Not a few students of the disease have expressed the belief that Hodgkin's disease may be an atypical form of tuberculosis, possibly due to an avian strain of the bacillus. Further, there is some experimental evidence to support this view.[3] However, confirmation is still lacking. In none of the cases in this series, except two presenting gross tuberculosis, were tubercle bacilli found, either at autopsy or in sections of excised glands. In one case involved glands were macerated and an emulsion injected into domestic fowl without producing lesions suggestive either of tuberculosis or of Hodgkin's disease. A study of many sections obtained at autopsy in the two cases showing gross tuberculosis led to the very definite conclusion that two distinct pathological processes were present. In tissues where the two lesions were found, side by side or together, no difficulty was encountered in separating the tuberculous nodules from those of Hodgkin's disease. Though necrosis did occur in five uncomplicated cases of Hodgkin's disease, in none of these did liquefaction of the tissue result, and in none were Langhans' giant cells encountered. In fact, where microscopic lesions of both types could be brought into one field of the microscope, and this occurred not infrequently, the tubercles with their central area of necrosis bordered by Langhans' giant cells stood out in striking contrast to the mononuclear and multinucleated giant cells of the Hodgkin's tissue. Granting for a moment dual etiology, why does tuberculosis occur so frequently in this disease? It might be assumed with reason that Hodgkin's disease, affecting as it does reticulo-endothelial structures *par excellence* permits dormant acid-fast infections to become active, and, once active, lower resistance might account for the rapid dissemination of the tuberculous process. The clinical histories and pathological findings in two of our cases clearly demonstrated the individuality of the two histological lesions and the rapidity with which the tuberculosis became disseminated. In one of these cases there was neither clinical nor x-ray evidence of tuberculosis on the patient's first admission. Eight months later x-ray showed some infiltration at the right apex. A fortnight later the x-ray showed diffuse tuberculosis throughout both lungs. In the second case apical tuberculosis was present on admission, though, clinically, activity could not be demonstrated at that time. Ample evidence of a rapidly spreading process was soon evident, however, and at autopsy both lungs were found to be riddled with the disease.

THE CLINICAL FEATURES

Age.—Fourteen, or 70 per cent, of the cases occurred between the ages of 18 and 40 years; 1 case in the first decade; 3 in the second; 5 in the third; 6 in the fourth; 3 in the fifth; 1 in the sixth; 1 in the eighth.

Sex.—Only 5 of the cases, or 25 per cent, were in females.

Predisposing factors. — We were unable to elicit definite predisposing factors in any of the cases. The disease invariably made its appearance while the patient was in his usual health. Hygienic conditions, food, debilitating circumstances, or occupational factors were negligible.

The development of the disease.—By far the greatest number of patients noticed lymph node enlargement before constitutional symptoms made their appearance, but as will be shown later, this did not indicate localization of the disease. The initial complaints in every case pointed to the adenopathy or to pressure therefrom. Thus the entrance complaint of 13 patients was "swollen glands". In two instances abdominal pain, due to enlarged retroperitoneal glands, was a major symptom. Three patients first complained of chest pain and cough with expectoration — in one instance frankly bloody. The two remaining patients sought relief for pains in the leg from pressure of enlarged inguinal lymph nodes. Constitutional symptoms, such as loss of weight, anæmia, fatigue, palpitation and dyspnœa on exertion were not present in any of the patients seen within a reasonable time after the development of the adenopathy.

The initial site of the disease.—Combining the clinical history given by the patient with the physical findings, the initial site of the disease was assumed to have been the cervical nodes in 8 cases, the mediastinal nodes in 6, the inguinal in 2, retroperitoneal in 1, the spleen in 1, the submaxillary in 1 and the axillary in 1. Primary involvement of the bone marrow did not occur

in any of the cases of this series, though it has been described.[12] The determination of the primary site of the disease was not always easy, because of its widespread nature even at the first visit of the patient to the physician. Thus, in 18 of the 20 cases a fairly general adenopathy was present at the first visit, in addition to the more marked local adenopathy for which treatment was sought. In one case the mediastinal glands alone were involved, and in the remaining one the physician's report is not such as to indicate the extent of the adenopathy. Nevertheless it must be accepted as a fact that in practically all cases the disease had involved more than one group of lymph nodes when the patient came under observation. The difficulty of determining the extent of the disease may be illustrated by the history of one patient in whom the cervical glands on one side were "completely" resected on three different occasions. The spleen was recorded as palpable on first examination in only one case, though splenic enlargement later in the disease was commonly recognized.

The physical findings in Hodgkin's disease.—The general physical state of the patient on admission seldom indicated the presence of extensive disease. Cachexia, anæmia and other constitutional symptoms were not often observed at the time of the first visit. As a rule the examination revealed little of note other than the adenopathy. The lymph nodes observed by the patient seldom attained great size. The largest individual glands were usually less than five centimetres in diameter, though a group of such glands in some instances gave greater measurements. The nodes, though commonly discrete, were sometimes matted together, but never adherent to the skin or adjacent structures. They were firm, though not stony hard. Fluctuation indicating softening and liquefaction of the gland occurred in only 1 case, which was complicated by tuberculosis, although necrosis was made out histologically in 5 cases. In addition to the enlarged group of glands noticeable to the patient, examination invariably revealed some enlargement of the nodes at a number of other sites, indicating widespread and general involvement of the lymphatic system, as in 18 of the 20 cases.

Fever.—Pel-Ebstein[14] or Murcheson[15] type of pyrexia occurred in only 3 of the 20 cases. Eight of the patients were afebrile throughout the course of the disease. Nine, or 45 per cent, had a persistent, though remitting, type of fever, reaching from 100 to 103° F. in the afternoon, remitting to the normal during the night.

Diaphoresis.—Sweating, commonly at night but sometimes during the day, was a noticeable feature in 8 cases. As would be expected, the patients showing wide fluctuation in the daily temperature had sweats, whereas those with persistently normal temperature did not.

Skin manifestations.—One of the most troublesome and intractable symptoms in 2 cases was pruritus. These cases showed no changes in the skin, either to the naked eye or in sections to indicate the cause. Pigmentation of the skin was sufficiently intense in two cases to attract attention. It was of a brownish colour and fairly generalized, but developed only after the patient had been under observation for a considerable time. It was of interest that one of these patients showed at post-mortem a nodule of Hodgkin's tissue in one adrenal. One developed lichenified papules over the legs, and although these lesions were thought by the dermatologist to be due to the disease yet they showed no characteristic cellular changes on histological study. The only patient who developed true Hodgkin's nodules in the skin, did so about the site of a biopsy incision.

Involvement of bone.—Involvement of bone or bone marrow by Hodgkin's tissue is not uncommon.[4 to 8] It occurred in 2 of the 20 cases in this series. In one case a mass of Hodgkin's tissue arising from the body of the tenth thoracic vertebræ caused pressure upon the cord and resulted in paraplegia. In another case there was extensive involvement of the 9th, 10th and 11th thoracic vertebræ, which were surrounded by a fusiform swelling. The entire lesion suggested Potts' disease. Later the right femur and second lumbar vertebra became involved. The appearance of these lesions was definitely altered by intensive deep x-ray therapy, and at autopsy they were found to consist largely of dense hyaline fibrous tissue, but with typical cellular areas scattered here and there in it.

Generalized amyloid degeneration of parenchymatous organs occurred in one case.

Laboratory data.—The basal metabolic rate was taken in three cases. In one it was plus 31 on one occasion and plus 40 a few days later.

TABLE 1

THE BLOOD PICTURE

No.	*Name*	*Count*	*Date*	*Hgb.*	*R.B.C.*	*W.B.C.*	*Plat.*	*Differential*							*Remarks*
								Pn.	*Ly.*	*Eos.*	*Bas.*	*Mon.*	*Mye.*	*Meta.*	
I.	Stryde. E. 1845-32	1st ct.	Sept. 21/31	88	4,3	10,3	318	73	22	2		3			
		av. ct.		*84*	*4,5*	*11,3*	*380*	*80*	*17*	*2*		*1*			*Av. of 5 counts*
II.	Ricci, V. 6736-27	1st ct.	Dec. 22/27	100	5,40	6,9		75	22	3					
	890-28	*av. ct.*		*84*	*4,82*	*11,02*	*460*	*82*	*11*	*5*		*2*			Last count taken day of death.
	5868-29 6817-29 180-30 6480-30	last ct.	Nov. 11/30	54	3,5	3,65	9,	58	12			3	24	1	
III.	Brookes, J. W.	1st ct.	Jan. 18/28	70	3,6	10,0		78		7	1.3				
	324-28		Feb. 20/28	104	5,0	17,0	675	90	2	8					
	3911-31	*av. ct.*		*85*	*4,6*	*9,4*	*318*	*79*	*13*	*6*	*1*	*1*			*Av. of 39 counts*
	1634-33	last ct.	May 9/33	30	1,9	4,6	89	69	17			5			
IV.	Hebert, L.	1st ct.	Jan. 21/32	66	3,9	9,3		70	22						
	1842-32		Apr. 1/32				241								
	Clinic 5773-32	*av. ct.*		*55*	*3,3*	*10,9*	*286*	*72*	*13*	*13*		*1*	*1*		*Av. of 29 counts*
	1265-33	last ct.	May 3/32	35	2,5	6,3		80	11			2	2		
			May 3/32				239								
			May 13/32			3,8									
V.	Coleman, H. G. 4621-31	1st ct.	Aug. 15/30	93	5,1	15,5	475	85	14	1					
	6538-31	*av. ct.*		*80*	*4,61*	*17,0*	*418*	*88*	*8*	*2*	*0*				*Av. of 18 counts*
	3866-32	last ct.	Oct. 11/32	83	5,5	12,5	210								
VI.	Sullivan, M. 997-26	1st ct.	Feb. 27/26	80	5,0	16,0		80	15						
	6049-26	*av. ct.*		*97*	*4,79*	*13,4*	*540*	*78*	*14*	*3*	*2*	*2*	*1*		*Av. of 9 counts*
	437-28 2663-28	last ct.	May 15/28	70	4,65	11,1		72	15	15	5				
VII.	Rayson, J.	1st ct.	Dec. 23/27	70	4,9	18,2	410	84	15				1		
		av. ct.		*68*	*4,1*	*13,9*	*335*	*85*	*12*	*0.6*					*Av. of 14 counts*
		last ct.	Dec. 30/28	75	3,1	25,8		92	6			2			
VIII.	Karsho, T.	1st ct.	Oct. 9/28	48	4,32	30,5		79	14	4		2			
	574-28	*av. ct.*		*61*	*4,20*	*27,03*	*390*	*85 5*	*8*	*2.6*		*1*			*Av. of 4 counts*
		last ct.	Dec. 1/34	79	4,66	25,6		89	7	3		1			
IX.	Hill, P. 526-29	1st ct.	Jan. 28/29	65	3,5	2,8		64	32	2					
X.	Malkonen, H.	1st ct.	Jan. 18/30	53	3,05	11,6		80	10	1		2			
	6126-29	*av. ct.*		*53*	*3,49*	*13,7*	*535*	*88*	*7*						*Av. of 6 counts*
XI.	Marder, L.	1st ct.	Aug. 13/31	56	3,0	15,7	433	87	9	2		2			
	4525-31	*av. ct.*		*56*	*3,2*	*14,1*	*510*	*84*	*13*	*2*		*1*			*Av. of 4 counts*
XII.	Cloutier	1st ct.	Apr. 22/29	92	4,12	10,8	461	79	10	2		3			
	2201-29	*av. ct.*		*90*	*4,39*	*8,15*	*461*	*80.5*	*11.5*	*3*		*2*			*Av. of 4 counts*
XIII.	Nelson, Wm. 486-29	1st ct.	Jan. 25/29	86	4,5	8,0		84	13	1	1		1		
	1018-29 2659-29	*av. ct.*		*84*	*4,31*	*7,2*	*355*	*83*	*12*	*4*		*1*			*Av. of 9 counts*
	5398-29	last ct.	Sept. 17/29	61	3,56	7,2	155	83	11			3			
XIV.	Davies, J. 4462-31	1st ct.	Aug. 6/31	65	41,1	10,6	396	84	8	2	1	2	2	1	
XV.	Birs, R.	1st ct.	Oct. 16/27	73	4,7	41,4	620	79	18	2				5	
	5854-27		Oct. 17/27			49,2		90	6		1	1	2		
		av. ct.		*72*	*4,4*	*34,6*	*520*	*87*	*10*	*1.1*	*0.5*	*0.5*	*0.5*		*Av. of 8 counts*
XVI.	Robert, E.	1st ct.	Aug. 12/27		3,1	38,8									
	4357-27		Aug. 16/27	73	4,9	69,5	600	32	23	45					*Av. of 5 counts*
		av. ct.		*70*	*3,8*	*62,7*	*533*	*42*	*12*	*42*			*2*		
		last ct.	Jan. 23/28	68	3,4	80,0	350	40	4	45			1		
XVII.	Maguire, C.	1st. ct.	Oct. 11/24	68	4,8	22,9		78	14			2	6		
	4717-24	*av. ct.*		*66*	*4,8*	*21,5*		*70*	*18*			*7*	*5*		*Av. of 5 counts*
XVIII.	Leslie	1st ct.	Mar. 31/33	88	4,4	22,3		80	18			1	1		
	1868-33	*av. ct.*		*88*	*4,4*	*21,8*	*291*	*83*	*16*				*1*		*Av. of 2 counts*
XIX.	Hudson, J. B.	1st ct.	Sept. 29/31	70	3,6	8,5	508	71	12	3		9	4	1	Only one count done. 486, 1018-2
XX.	Daignault, J. 1950-25	1st ct.	Apr. 30/25	78	4,5	17,8	520	81	11	5		1	1	1	
	6091-26	*av. ct.*		*78*	*3,8*	*10,3*	*378*	*70*	*15*	*8*		*3*	*2*		*Av. of 13 counts*

In a second the one rate taken was plus 23, and in a third it was almost within normal limits (plus 11).

The blood examination. — Considerable controversy has arisen as to the nature and degree of the blood changes which occur in Hodgkin's disease. Some authors, notably Bunting,[9] have found very definite changes, while others, as McAlpine[10] and Falconer,[11] have been unable to confirm these findings. The blood in all the cases in our series was studied, and in many numerous observations were recorded at intervals during the course of the disease from beginning to end. A study of the data obtained permits

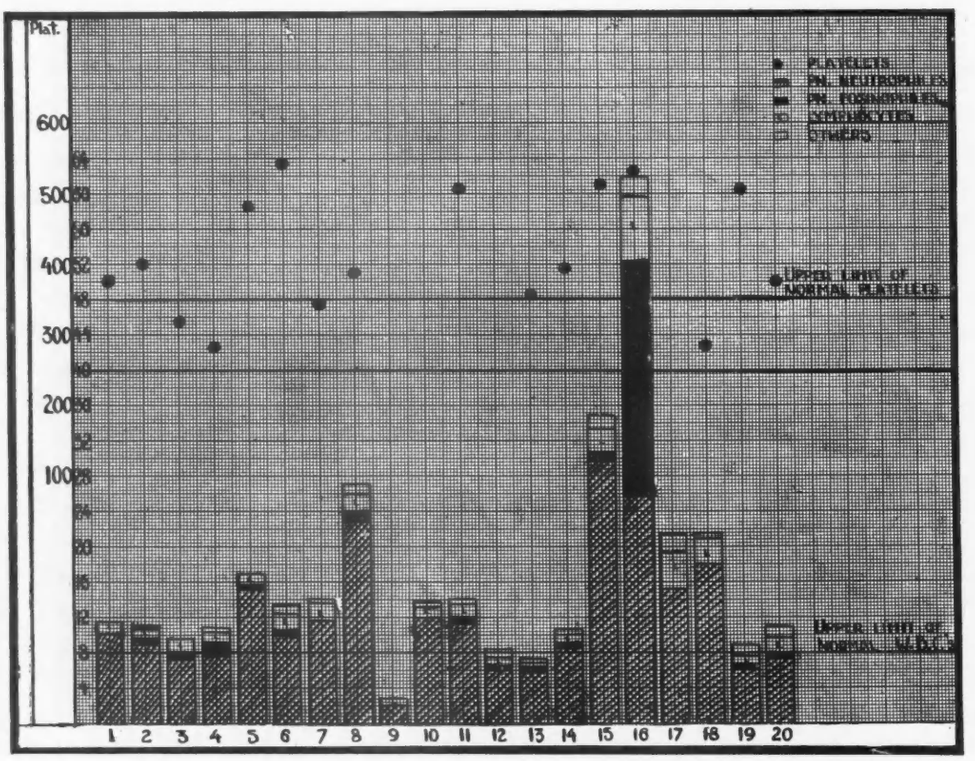

CHART 1

of an explanation of this diversity of opinion. The initial blood findings in all the cases in this series, together with the average count and the final count in cases under observation for a sufficient period of time are recorded in Table I. The actual number of blood counts done in each instance is indicated. From the Table (page 53) it is possible to condense the findings:—

Blood findings on admission.—Twelve, or 60 per cent, of the patients had a normal red cell count. In 3 there was slight anæmia; in 5 the anæmia was moderate, but in no case had the erythrocyte count dropped below the three million mark. A polymorphonuclear leucocytosis (above 9,000) occurred in 16 of the 20 cases. In 3 cases the leucocytes were normal and in 1 a leucopenia occurred. The patient with the leucopenia was first seen fourteen days before his death. The blood platelets were estimated in 18 of the 20 cases. In 15 there was a thrombocytosis or increase in platelets; in 3 the count was normal. In no case was the count low. As a rule the patients with leucocytosis also had thrombocytosis.

The average blood values.—In 16 cases four or more blood examinations were made at different times during the periods of observation. In one case 39 counts, and in a second 29 counts were done. Taking an average in each of these 16 cases, which are all shown in the chart, the following summary was obtained. Five cases gave an average normal red count, 6 had an average count above four million, and 5 had a count ranging from three to four million. In not one did the mean values fall below three million. The average leucocyte level was high in 14 of 16 cases and normal in 2 cases. In these 14 cases the differential leucocyte count indicated that the increase was one of granular leucocytes. Eosinophilia occurred in only 5 of these cases, if one considers 4 per cent to be the upper limit of normal for these cells. It was of

interest that the highest recorded leucocyte count occurred in the youngest patient, a child of three, and that a majority of the leucocytes were eosinophiles. The highest value was 80,000 leucocytes, 45 per cent of which were polymorphonuclear eosinophiles. The average platelet count was above the normal in 12 of 16 cases; in 5 the average count was within normal limits. Chart 1 is an attempt to show graphically the average values for the various leucocytes and the platelets. In 4 cases the values are based upon less than four counts. A glance at the Chart and Table shows four things: (1) that most cases of Hodgkin's disease show an increase in granular leucocytes; (2) that there is seldom a severe degree of anæmia; (3) that the blood platelets tend to be at or above the upper normal limits; (4) that eosinophilia is not a very constant feature.

The terminal blood picture.—By considering the terminal counts in the 11 cases followed until death the final blood picture was obtained. Two showed a severe anæmia, the lowest count being 1,900,000; in 6 the anæmia was still moderate; 3 had no anæmia. As regards leucocytes, only 6 had a polymorphonuclear leucocytosis. One showed a normal count, while leucopenia was present in 4 cases. The terminal platelet counts were made on 8 cases. In only 1 was the platelet count still high; in 5 it was low, and in 2 it was within normal limits.

Summarizing the changes which took place in the blood picture from the time the patient was first seen with the disease until death, it may be stated: (1) that a moderately severe anæmia gradually makes its appearance, but the red count rarely drops below the three million level; (2) the leucocytes tend to remain elevated throughout the course of the disease, but towards the end normal values and leucopenia are often encountered; (3) that the platelets, which are invariably high throughout the disease, drop to or below the normal level in its terminal stages. These points are well illustrated in Charts 2 and 3 of cases 3 and 5 which show the blood values from the time of admission to the time of death. It should of course be borne in mind that persistent deep x-ray therapy may influence profoundly all blood values. It need hardly be mentioned that the effect is to reduce the activity of the bone marrow. The greatest effect would seem to be upon the granular leucocytes and platelets with seldom any noticeable disturbance of erythropoiesis.

It will be evident from the foregoing observations that the blood picture obtained in a given case of Hodgkin's disease will depend upon whether the observation is made early in the disease, in a late phase, or, perhaps, after prolonged treatment. This consideration led McAlpine and, later, Falconer to divide the cases into those over and those under one year's duration. Such an arbitrary division would seem to be unwise in a disease which may be rapidly fatal in one instance and progress slowly over a period of years in another. A year represents a long time in the one and a comparatively short period in another. It may explain partially why so many conflicting blood reports have been recorded in the literature. It would seem wiser, therefore, from a hæmatological standpoint, to consider only early and late phases of the disease and avoid a division on the basis of a definite period of time.

The clinical course.—The course of Hodgkin's disease, as indicated by this series, may be rapidly fatal or slowly progressive. The average duration of life in the 11 cases which died under observation was twenty-nine and a half months after the onset of symptoms. The longest course was 6 years and the shortest 3 months. Although constitutional symptoms, such as loss of weight, anorexia, fatigue, dyspnœa on exertion, and cachexia, were not part of the early picture in the series, they made their appearance as the diseased progressed, and the final picture was similar to that of advanced malignancy of whatever type. The superficial glands seldom attained a great size, especially after persistent deep x-ray treatment, and in some instances they disappeared completely. The spleen, which was rarely enlarged early in the disease, unless this was primary in that organ, was invariably sufficiently enlarged to be palpable long before the terminal stage. However, in spite of the most assiduous use of radium and x-rays, the deep lymph nodes enlarged and commonly caused pressure symptoms. At the time of the writing of this paper approximately 10 years after the first cases came under observation, 16 are known to be dead, 3 could not be traced, and only 1 patient, observed in 1933, is alive. It is of interest, however, that Leucutia[16] and other authors[13] have

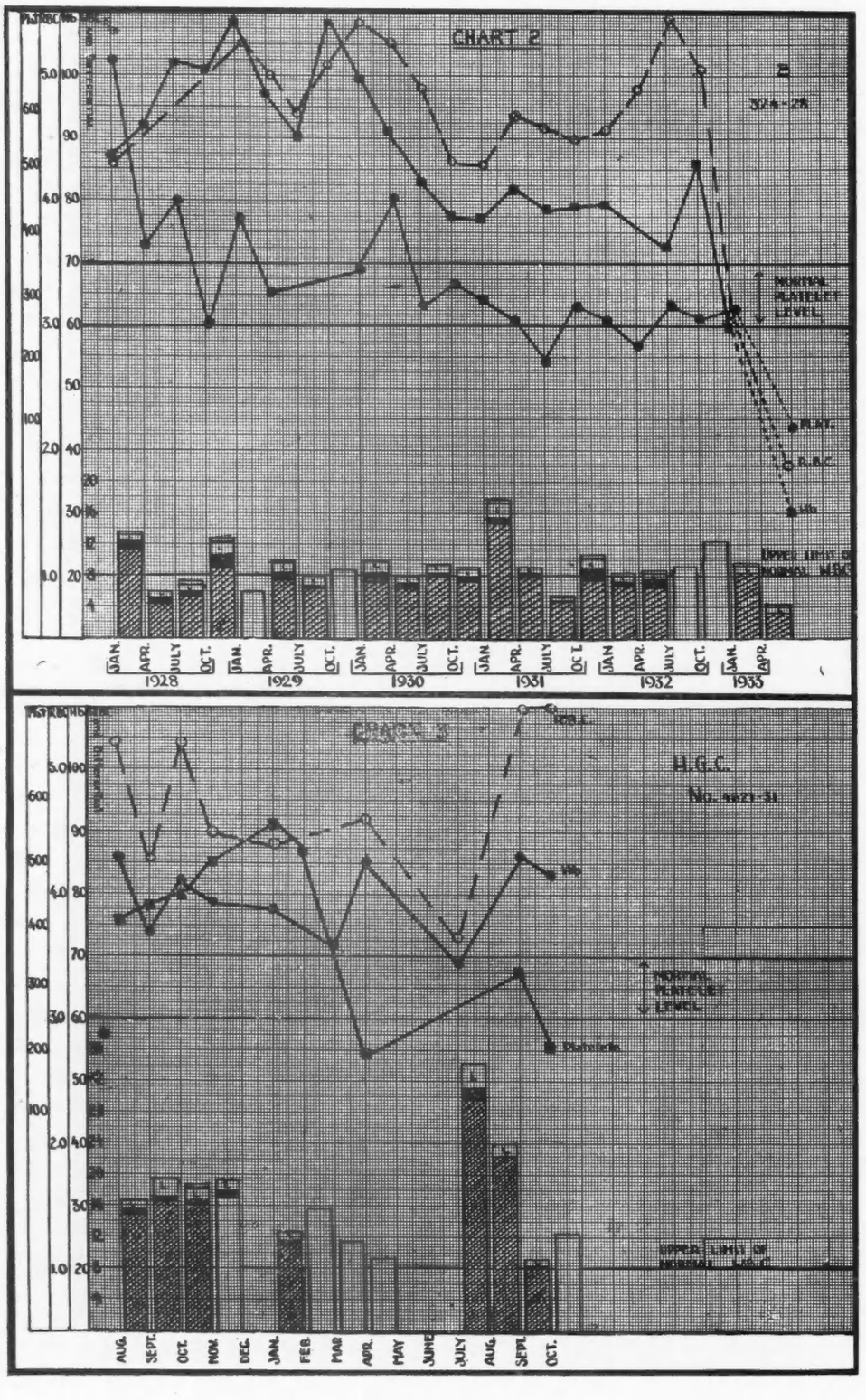
CHART 2
1928
1929
1930
1931
1932
1933
JAN.
APR.
JULY
OCT.
AUG.
SEPT.
NOV.
DEC.
FEB.
MAR
MAY
JUNE

reported ten-year survivals in a small percentage of cases, and reference is made to a few cases well for a sufficiently long period to indicate a cure. The occurrence of necrosis of glands with liquefaction or sinus formation should at once lead to the suspicion that tuberculsis is present as a complicating factor.

Diagnosis.—The diagnosis in most instances presented no great difficulty if the case came under observation before the terminal period. When the adenopathy was recognizable, and the blood picture showed polymorphonuclear leucocytosis and thrombocytosis, a tentative diagnosis of Hodgkin's disease was invariably confirmed by biopsy examination. In one case the character of the glands was such as to suggest lymphosarcoma, and in spite of a blood picture favouring Hodgkin's disease this diagnosis was persisted in until the pathologist reported a sarcomatous type of Hodgkin's disease. In several cases the diagnosis of tuberculous adenitis was entertained clinically until leucocytosis and thrombocytosis were reported. It is of note that the clinical diagnosis of Hodgkin's disease was not infrequently relinquished when the blood examination showed leucopenia and thrombopenia. Biopsy invariably showed that these cases were tuberculous adenitis. When the disease manifests itself by enlargement of retroperitoneal or mediastinal glands, biopsy may be impossible until an accessible lymph node becomes involved. In such cases the histological report of the pathologist may be anticipated and correct treatment promptly instituted, thus adding considerably to the patient's expectancy of life. As a result of the hæmatological findings in this series and in cases of tuberculous adenitis observed during the same period it seems fair to assume that cases of adenopathy showing an elevation of leucocytes and normal or high platelets are Hodgkin's disease, and those showing leucopenia and low platelets, tuberculous adenitis, until such time as the diagnosis can be confirmed by biopsy. Cases of lymphosarcoma give varied hæmatological pictures. In the diagnosis of Hodgkin's disease, as in diagnosis generally, mistakes are generally avoided by a careful summing-up of all evidence gleaned by the bedside and in the laboratory. It would seem from this small series of cases, however, that the pioneer observations of Bunting in regard to the leucocytes and platelets in Hodgkin's disease are of major importance in the differential diagnosis of the chronic adenopathies. If more importance were placed upon these and less upon the presence or absence of eosinophilia we believe fewer errors in clinical diagnosis would result.

DISCUSSION OF THE ETIOLOGY OF HODGKIN'S DISEASE

A discussion of the cause of Hodgkin's disease is as fruitful of definite conclusions as of the cause of cancer or leukæmia. However, as one reviews the pathology of the disease and weighs the clinical evidence as presented by this series of cases certain impressions as to the nature of the process become firmly established. Superficially, the pathological histology appears to be that of a granulomatous process. The clinical features, notably fever and leucocytosis, would appear to lend support to this assumption. None of the cases in this series revealed any of the suggested etiological agents, such as an avian tubercle bacillus, a diphtheroid, or a virus, though no real attempt was made to exclude virus infection. Krumbhaar,[17] in a recent analysis weighs the evidence and casts his vote in favour of the infectious theory. He would include Hodgkin's disease among the virus diseases. Equally eminent authorities, such as Mallory and Warthin, have adhered firmly to the neoplastic theory.

The histological appearance of the lesions in most cases in this series was at first sight that of a granuloma. On the other hand sections from the lymph node in one case presented all the characteristics of a tumour in rapid growth. The same problem was encountered in dealing with two other cases. Both of these presented striking similarities and equally striking differences. They were observed over a similar period of time, five to six years; they were treated in the same way; and the duration of the disease was almost identical; biopsy examination of an excised lymph node showed the same histological picture; the post-mortem showed in both cases generalization of the process throughout the entire lymphatic system; and yet in one case histological studies of lungs, liver, kidneys, adrenals, intestine and bone marrow failed to show infiltration, while sections of these organs in the other case showed extensive involvement.

Further, the metastatic nodules in the latter case were similar in histological appearance to the lesions in the lymphatic tissues in the other. Both presented the characteristics of a granuloma rather than a sarcoma.

The literature contains instances of apparent transformation of a granulomatous type of Hodgkin's disease into a sarcomatous process, and, strangely enough, a number of instances of the reverse process, namely, the metamorphosis of a sarcomatous type of Hodgkin's disease into an apparent grauloma.[18 to 21] Such cases do not help to clarify the problem of the etiology of the disease. In the present series the essential histological picture in all cases was a replacement of the normal architecture of the lymphatic structure by cells which appear to be derivatives of reticulo-endothelium. The finding of polymorphonuclear neutrophiles and eosinophiles in the affected tissues is not constant, and is not regarded as essential to diagnosis. The underlying process, then, is primarily uncontrolled overgrowth of cells of reticulo-endothelial origin. The occurrence of numerous granulocytes in blood and tissues might result from involvement of reticulo-endothelium in the bone marrow. The thrombocytosis might be explained on the same basis. The conception of Hodgkin's disease as a type reticulo-endothelial leukæmia would explain many of the clinical features of the disease. It would explain the fever, the early generalized involvement of the reticulo-endothelial structures, the increased metabolic rate in some instances, the temporary favourable response to radium and deep x-ray therapy, and, finally, the ultimate hopeless prognosis. Although conscious of the many defects in such a hypothesis, we feel that the clinical features of the disease can be correlated with the pathological histology better upon this than on either a granulomatous or sarcomatous basis.

The authors' thanks are due Prof. C. P. Howard and Prof. A. H. Gordon for permission to use clinical material from their medical services, and to Miss Eleanor MacKinnon, B.Sc., for technical assistance.

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CONTRACEPTIVES AND CANCER.—With the rapidly extending and increasing use of contraceptive methods the long debated relationship between certain of these methods and the incidence of uterine or vaginal cancer assumes a position of greater importance. Two general types of contraceptive procedure are to be considered—the chemical and the mechanical. A third method, namely that of sterilization can be dismissed with the unfortunate and revealing statement that no body of available data is recorded which enables anyone to state whether sterilized women have less cancer, more cancer or the same amount of cancer as fertile individuals. The whole matter resolves itself to a simple process of utilizing intelligently what is already known of the relationship between chronic irritation and cancer, to avoid carefully the use of any contraceptive method which involves that unnecessary and dangerous risk. This can be done easily and effectively and should result in making clear to those of the general public who employ contraceptives the fact that no causal relationship between contraception and the incidence of cancer need exist.—*Bull. Am. Soc. for Control of Cancer*, 1935, **17**: 9.

ACUTE CHOLECYSTITIS*

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ACUTE cholecystitis has been extensively discussed in the surgical literature during the last five years. A review of more than 30 essays makes it plain that a wide diversity of opinion exists among surgeons regarding its proper treatment. This diversity of opinion is most marked concerning the time when operation should be performed. The vast majority favour waiting until all symptoms have subsided; a small minority believes that early operation (within 48 hours of onset, when possible) yields the best results.

Some of you will remember that forty years ago a similar debate was carried on by the profession on the question whether an early operation or an interval operation gave better results in acute appendicitis. At that time Sahli,[1] then Chief of the Medical Clinic at Bern, in reply to a questionnaire sent to the physicians of Switzerland wrote: "I received replies from a total of 466 physicians. The material covered by the answers consisted of 7,213 cases of perityphlitis. In this series there were 473 cases treated by operation and 6,740 cases treated with non-operative measures. Among those operated on there were 101 deaths (21 per cent), while 372 patients (78.7 per cent) recovered. In the group not operated on there were 591 (8.8 per cent) fatalities and a total of 6,149 (91.2 per cent) recoveries." Before the end of the nineteenth century several surgeons reported a mortality from early operation of less than 3 per cent. By definitely determining the mortality of non-operative treatment, Sahli contributed greatly to the solution of the question regarding the treatment of acute appendicitis. A similar study of acute cholecystitis is necessary before we can reach a conclusion regarding its most effective treatment.

MEDICAL TREATMENT

The mortality under medical treatment is not stated in any of the modern text-books of either medicine or surgery. It is therefore fair to conclude that it is not known. That the great majority recover is undoubtedly true. The recovery, however, is rarely, if ever, complete, and the proportion of those recovering who have subsequent attacks has never been ascertained, but is certainly very high. In the absence of knowledge on such important points an opinion as to the best method of treatment is surely unwarranted.

I have studied the records of 204 cases of acute cholecystitis occurring in the hospitals of Winnipeg during the last five years. Seventy-four were my own private patients and 130 hospital cases. The diagnosis of acute cholecystitis was accepted when the record showed a history of colic, a temperature of 100° or more, and a leucocytosis of at least 12,000. Those treated medically, 76 in number, are included in Table I, along with others obtained from the literature.

TABLE I

UNDER MEDICAL TREATMENT

	Total	*Improved*	*Unchanged*	*Worse*	*Died*
R. J. McNeil Love	69	60		9	
M. M. Zinninger	54	20	19	15	
S. H. Mentzer	63				14
G. H. Pratt	45		45		
M. K. Smith	94	94			
Local hospitals	76	69	5		2
Total	401	292	69	24	16
Percentage		72.8	17.2	6	4

This Table shows that 69 patients were not improved, 24 became worse, and 16 died, in all 109, or 27 per cent of the 401, in whom medical treatment failed. But 401 is too small a number to warrant a conclusion as to the efficiency of medical treatment. This can only be determined by a study of the records of at least 3,000 cases. Of the 76 local hospital patients 69 were discharged from hospital "recovered", more than half of them within 10 days. The cause of death in the two fatal cases could not be ascertained from the hospital records.

* Read before the Surgeon's Club of Winnipeg, November, 1934.

Table II, compiled from the literature of the last five years, including 54 obtained from the records of the local hospitals and 74 comprising the author's total operations upon acute cholecystitis, presents a total of 2,270 cases operated upon, with 231 deaths, a mortality of 10.0 per cent. The number is large enough to warrant the conclusion that 10 per cent is the average mortality of operations done during and in the interval after the attack.

The day of the attack on which operation was performed is rarely stated in these reports, so it is fair to assume that the vast majority of them were done after the subsidence of symptoms. A mortality of 10 per cent is altogether too high to render the interval operation a satisfactory means of treatment. That early operation during the first 48 hours of the attack might yield better results is indicated by Table III, showing a mortality of 1.4 per cent.

TABLE II

UNDER SURGICAL TREATMENT

Operative Mortality in Acute Cholescystitis

				Cases	*Deaths*	*Percentage*
R. P. Rowland.....	*The Lancet*	May 7,	1932	116	20	17.2
G. H. Pratt.....	*Am. J. Surg.*	October,	1933	45	10	22.2
S. H. Mentzer.....	*Surg., Gyn. & Obst.*	December,	1932	71	16	22.5
M. Zinninger.....	*Ann. of Surg.*	September,	1932	89	7	7.8
R. J. McN. Love.....	*The Lancet*	September 23,	1929	90	15	16.6
M. K. Smith.....	*Ann. of Surg.*	October,	1933	107	10	9.3
H. F. Graham.....	*Ann. of Surg.*	June,	1931	198	11	5.5
H. Kment.....	*Beitr. z. klin. Chir.*	C1534,	1930	117	17	14.5
F. S. Fowler.....	*Am. J. Surg.*	October,	1933	545	56	10.3
R. Miller.....	*Ann. Surg.*	October,	1930	200	27	13.5
Judd and Phillips.....	*Ann. Surg.*	October,	1933	508	24	4.7
G. Heuer.....	*West Va. Med. J.*	6:1,	1930	56	3	5.0
Local hospitals.....				54	10	18.5
Author				74	5	6.7
Total.....				2,270	231	10.0

TABLE III

Operation within Forty-eight Hours of Onset

Author	*Cases*	*Deaths*
H. F. Graham.....	20	1
M. M. Zinninger....	12	0
G. H. Pratt.....	23	0
Author	14	0
	69	1

1.4 per cent mortality

In 98 of the 128 surgical cases personally studied (54 from the records of local hospital and my own 74) the day of operation is recorded as given in Table IV.

The number of cases in Tables III and IV is too small to be more than suggestive, but the data, so far as they go, support the view that early operation may prove to be the best method of treatment. This is also in accord with a few surgical opinions as expressed in the literature of recent years.

PATHOLOGY

The study of the pathology disclosed by operation upon the living has done so much to clarify our understanding of intra-abdominal disease that the operative findings and the gross appearances in my 74 cases may be worth presenting.

I have adopted the classification given by A. J. Walton[2] in his text book on surgical dyspepsias.

TABLE IV

Operation time period	*Cases*	*Deaths*	*Mortality percentage*
During the first 3 days	25	1	4
From 4th to 10th day..	33	3	9
After the 10th day....	40	5	12
	98	9	

1. *Acute catarrhal cholecystitis,* or, as I think, a better term—*uncomplicated acute cholecystitis.* Thirty-five of the 74 cases belong to this group. In 32 of them the cystic duct was obstructed by a large stone in Hartmann's pouch or a smaller stone impacted in the mouth of the duct. The gall bladder is always greatly distended, its walls from 0.5 to 1 cm. in thickness, the colour a deep purplish pink, the contents slightly bile-

stained, sero-mucous, often slightly purulent. The peritoneal coat usually retains its lustre, but may have patches of inflammatory lymph, less often recent frail omental adhesions. The mucosa sometimes shows necrotic patches, and is usually soft and easily rubbed off from the underlying fibro-muscular coat. The mucous membrane is much more easily detached from the fibrous coat in the acutely inflamed than in the normal sac.

This pathological type is found in cases operated upon during the first five days of the attack, rarely after the first week.

2. *Acute suppurative cholecystitis* or empyema of the gall bladder — 39. The operative findings in this group are as follows; a gall bladder usually buried in adhesions of omentum, transverse colon or duodenum. These adhesions are denser and more difficult to detach than those in group one. The sac is found usually to be necrotic in places, its contents purulent, with stones present in 37, or 95 per cent of the 39. In 7 of the 39 pericystic abscesses were present, and in 5 the gall bladder had ruptured through a necrotic area, with extravasation of stones and pus into a pocket walled about by duodenum, transverse meso-colon, and liver. In all these 5 the pus pocket was effectively circumscribed, and and as bile no longer enters such a gall bladder the danger of general peritonitis from leaking of such an abscess would seem to be very slight. The gross specimen shows the mucosa to be necrotic over areas of variable dimensions.

In 3 of the 5 ruptured gall bladders cancer was present, and was no doubt the cause of the rupture. This is the pathology of the stage of complications, commonly found at operation during the second, third and fourth weeks.

3. *Acute perforation.*—I have had 3 cases of acute perforation. All occurred in association with severe colic. Persistent continuous rigidity in the right upper quadrant lead to early diagnosis and operation. The finding in each was free extravasation of bile from a perforated gall bladder showing little evidence of inflammatory reaction; consequently these 3 are not included in the list of acute cases. All the patients had a smooth convalescence. This is quite a different condition from the rupture associated with the stage of suppuration and gangrene.

With these operative findings in mind we are in a position to consider the result to be expected in those cases that recover from the inflammatory attack under medical treatment. In those in which the symptoms subsided within one week the pathological process will most likely not have advanced beyond that presented in group 1. We have seen that in group 1 the gall bladder is greatly thickened by inflammatory œdema, in 92 per cent of cases contains stones, and the cystic duct is obstructed either by œdema or stone. We know that a gall bladder into which bile does not gain entrance soon becomes a septic sac. The re-entrance of bile is essential to any degree of resolution. The best that can be expected in these earlier cases, therefore, is to have a sac which, being largely transformed into fibrous tissue, has lost its functions of contraction and absorption, is no longer of any service, and, as it contains stones in over 90 per cent, is most unlikely to remain quiescent for any length of time. In group 2, in which the stage of suppuration and complications has been reached, the result is a chronic empyema, constituting a focus of continuous infection, and, by reason of the adhesions, a source of derangement of gastric function; further, when we remember that from 2 to 5 per cent of stone-containing sacs acquire malignant change the need for removal is evident.

Subsidence of the attack, therefore, leaves the patient with a pathological process of serious character which can be removed only by operation. I am aware that the *vis medicatrix naturæ* is sometimes surprisingly efficient, so we are not justified in believing from a study of the pathology only that none of these patients can recover without operation, but we do know from clinical experience that operation will eventually become necessary in the majority.

TREATMENT

This consideration of the conditions found at operation leads to the conclusions that a gall bladder, once the subject of acute inflammation, rarely, if ever, again becomes a normal organ, that it usually becomes a source of systemic toxæmia, by harbouring microörganisms and by adhesions, a cause of disturbance of gastric function, and that its removal is necessary before restoration of health can occur. We have seen that its removal during the suppurative stage, even after the subsidence of symptoms, is asso-

ciated with a mortality too high to justify it as a method of choice.

The data presented, while insufficient to warrant a definite conclusion, do suggest that operation done in the early stage, within 48 hours of the onset of the attack, has a mortality low enough to justify it as a routine measure. Apparently medical treatment fails in approximately 25 per cent of cases. If this treatment is going to succeed signs of improvement should be evident within 24 hours of the onset of colic. The absence of such signs I have accepted as an indication for immediate operation.

Table I shows that of Love's 69 cases,[3] 9 became worse and were operated upon "as a life-saving measure", with 3 deaths—a mortality of 33 per cent. Geo. J. Heuer,[4] from a study of 14 reports, found that operation during the stage of complications showed an average mortality of 46 per cent. When operation becomes imperative as a life-saving measure in this stage it should be limited to drainage, done under local anæsthesia. From my study of the literature I believe that the highest mortality results from operation done during the stage of complications before complete subsidence of all clinical symptoms.

In 50 of the 128 surgical patients studied in this paper, (my own 74 and 54 hospital cases), a cholecystostomy only was done. Experience has amply established that this is not a curative measure and that a second operation for the removal of the gall sac has to be resorted to later in the great majority of cases.

Partial cholecystectomy is an operation that gives as good permanent results as complete cholecystectomy, and, as shown in Table V is less dangerous.

TABLE V

Cases Operated Upon by the Author

	Deaths
19 Cholecystostomy	0
28 Partial cholecystectomy	1
27 Complete cholecystectomy	4
74	5, or 6.7 per cent

This favourable experience with partial resection of the gall sac leads me to regard it as the operation of choice in all acute cases in which anything more than simple drainage is considered safe. The technique I have followed is as follows. The tensely distended sac is emptied by aspiration, opened, the stones removed, and its cavity swabbed out with iodine. An iodine pack is left in the sac, while the cystic duct and artery are exposed and tied. The sac is then excised, either from above downward or from below upward, leaving the portion attached to the liver undisturbed. From this portion the softened mucosa is easily removed by rubbing with gauze, preferably saturated with iodine. In these acute cases the gall sac is easily pulled off its bed in the liver by traction, so too much force by the assistant in elevating the gall sac must be avoided. In one case in which the sac was completely pulled off a very stormy convalescence resulted. The complete removal of the gall sac leaves a denuded raw surface on the liver which, I believe, adds greatly to the danger of toxæmia and to what has been called "liver death". Lahey[5] calls attention to the difficulty of covering this denuded area in acute cholecystitis.

In all excepting the extreme bad-risk cases, in which a drainage operation only is permissible, partial resection has proved in my hands a comparatively safe operation, yielding just as satisfactory permanent results as complete cholecystectomy. In the late-stage cases with suppuration and gangrene of the gall sac it is the only operation indicated. I find in the literature only two references to partial resection of the gall sac. W. L. Estes, Jr.,[6] reports 7 such operations in acute cases without mortality; and Judd and Phillips[7] speak of the removal of the gall bladder "except that portion embedded in the liver" in 419 cases, but fail to give the mortality or state whether theirs were acute or chronic cases.

DIAGNOSIS

As every attack of acute cholecystitis begins with hepatic colic the diagnosis is never difficult. Only when it occurs as a complication of typhoid fever may the initial colic be absent. A continuation of the colic for more than 12 to 24 hours means that the cystic duct is still obstructed and that acute cholecystitis will most likely develop. In my 74 cases the duct was found obstructed by a stone in 69, or 93 per cent. When the inflammatory reaction has developed some rigidity of the upper right

quadrant persists between the spasms of colic. At this time there will also be moderate increase in leucocytes and elevation of temperature.

The systemic symptoms subside under medical treatment in at least 70 per cent. Subsidence occurs within a week in more than half; in a small proportion symptoms persist for two or three weeks. Many writers point out the difficulty of determining by clinical examination the character of the pathological changes left after systemic symptoms have subsided. Study of my own cases supports the opinion that the serious complications of the suppurative stage will be found in most of those in which the attack has lasted longer than a week. Morris K. Smith[8] reports that in 94 cases in which operation was done after the subsidence of systemic symptoms 20 per cent revealed this type of lesion. It has been amply established that the absence of systemic symptoms does not mean the absence of serious pathological disturbance.

SUMMARY

1. Data are presented which show that medical treatment in 401 cases yielded a mortality of 4 per cent and that it failed to effect improvement in 27 per cent. The number of cases, however, is too small to warrant a conclusion. The determination of the efficiency of medical treatment requires a study of the records of at least 3,000 cases. Such a study should determine the mortality, the percentage cured, *i.e.*, symptom-free, for, say, two years, and the percentage requiring operation within two years to effect a cure.

2. Data are presented which show a mortality of 10 per cent for late operations done during and after the subsidence of the attack. The number is large enough to warrant the conclusion that this is the average mortality of operations done during this period.

3. Data are also presented which show that operation done within 48 hours of onset carries a mortality of only 1.4 per cent. As the number is too small to warrant a conclusion further clinical research is needed to determine the value of early operation.

4. Partial cholecystectomy was performed in 33 acute cases, with one death.

5. Whether early operation (within 48 hours of the onset of colic) or operation done after the subsidence of the attack is the better method of treatment can only be determined by further clinical research.

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BLOOD VESSEL TUMOUR OF THE SPINAL CORD IN A BOY AGED NINE YEARS WITH ESPECIAL REFERENCE TO A NEW DIAGNOSTIC SYNDROME.—William C. Black and Harold K. Faber, San Francisco, cite a case of intradural venous blood vascular tumour, probably hæmangioendothelioma with associated varices, in a boy aged 9 years, in which the combination of the Froin syndrome, a negative Queckenstedt test becoming positive after withdrawal of spinal fluid below the lesion and a peculiar distribution of iodized oil in droplets suggests that it may be pathognomonic of subarachnoid varices and vascular tumours of the cord large enough to obstruct the subarachnoid space. It is apparent to them that their case presents a unique combination of spinal fluid changes. The conjunction of the Froin syndrome with a negative Queckenstedt test, which becomes positive when the lumbar sac is drained of a relatively small amount of fluid, could probably not be produced by any type of lesion other than the one under consideration. The vascular tumour, whether composed of varices or smaller vessels, transmits pressure from the subarachnoid space above to the lumbar sac below, thus acting essentially as a column of liquid, even though there is no direct communication between the two. However, when the fluid is drawn off below and the tumour sags down under the unopposed pressure from above, the attachments of the tumour are drawn tight, producing an obstruction in the spinal canal like that of a solid tumour and so causing the Queckenstedt test to become positive. Worthy of special attention is the peculiar distribution of iodized oil in droplets over two or more segments. The progress of the case harmonizes with the view expressed by Sargent and Rand that operation (laminectomy) is of little or no permanent value. Globus and Doshay believe that operation affords some benefit as the result of decompression. The authors' patient was slightly improved after operation but only for a short time. Spontaneous remissions, especially in cases of varices, have been repeatedly noted and may explain temporary improvement as well as does decompression. High voltage roentgen therapy was without detectable effect.—*J. Am. M. Ass.*, 1935, **104**: 1889.

THE ANTIPYRETICS

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THE antipyretics, phenazone (antipyrine), phenacetin, and amidopyrine (pyramidon), now contained in the British Pharmacopœia, were introduced for the relief of fever and are so used today, though perhaps less frequently than formerly. Medical opinion today is less fearful of the effects of fever temperatures, and measures for increasing the heat loss are less persistently used than previously. Medical thought, too, is divided on the use of the antipyretics, as some clinicians fear the deleterious effect on the heart muscle that these drugs have in toxic doses or that the long-continued use of therapeutic doses exert. Consequently they prefer to use hydrotherapy and other means for the reduction of temperature. Yet the whole burden of pharmacological and clinical evidence goes to show that the occasional exhibition of antipyretics does no harm, nor does their use prevent the development of the various protective mechanisms of the body; on the other hand their administration does much to make the patient more comfortable, and enables him to enjoy and make use of his nourishment more satisfactorily. It is not, however, with this aspect of antipyretics that this paper is intended to deal primarily, but with their action in relieving pain.

Antipyretic drugs depress particularly those minor or moderate pains that arise from internal membranes and connective-tissue structures. They are less effective in the case of pain arising from the skin. It is generally agreed that they have some effect, distantly resembling morphine but less definite, in depressing the central perception of painful stimuli. They may be regarded in a minor sense as weak general anæsthetics, and to this depressant effect some attribute their action in reducing fever.

The physician who uses antipyretics in headache or neuralgia recognizes that they are only palliatives; palliatives that, if he be wise he will use until the cause of the suffering can be ascertained and rectified. Sometimes the fundamental cause will escape his most patient investigation, as is true of many cases of migraine, but the effort must always be made. Further, in using these agents, he must often experiment with the various members, for they differ somewhat in their effects, and also experiment with their combinations with other drugs, such as are suggested below.

The cause of headache is doubtless not always the same; it may be essentially a referred pain, secondary to an inflamed sinus, or from the meninges or from an absorbed poison. We know of only one experimental headache, that produced by histamine, whose analysis was attempted by Pickering. He considers that this headache is brought about by the stretching of the cerebral arteries where they pierce or are surrounded by the meninges, owing to a lack of the normal equilibrium between the internal pressure of the artery and that of the intracranial contents. It is known that the above-mentioned antipyretics do lead to a dilatation of cerebral vessels and relief of a spasm of the cerebral vessels, and even those of the scalp, may be a cause of headache. The author remembers very clearly a case where the temporal artery seemed to fade away very suddenly from a full bounding vessel, and this was accompanied by a marked headache, which was promptly relieved by phenacetin, when the vessel was traceable much further with the finger. It is possible that some headaches, especially the pulsating variety, even if reflexly produced, are of a similar vascular type and their direct relief may be due to the vasodilatation produced by the antipyretic. The relief of other minor pains and other headaches depends more probably on the depression of pain perception.

The antipyretics are all dangerous drugs, though not in reasonable single doses or when given interruptedly or for short periods. Long ago we found the danger of anæmia and cardiac

weakness if acetanilid or phenacetin were taken for long periods of time. Today we know the danger of liver degeneration from cinchophen and of agranulocytic anæmia from amidopyrine. The skin disturbances due to acetylsalicylic acid are beginning to be recognized, but fortunately seem rare and not serious.

The physicians who advise the sufferer from minor pain to buy some aspirin or phenacetin or even a proprietary headache remedy, have undoubtedly aided in the widespread debasement of public health by proprietaries of this character. These antipyretics should only be sold on a physician's order and recognized by him only as palliatives, and used only until the cause is removed, if this is possible. Acetylsalicylic acid, as the least dangerous, might be freed from such restriction.

Acetanilid was so loudly declaimed as a cause of cardiac weakness that its sale in Great Britain fell to the point that it is no longer included in the Pharmacopœia. The Canadian Committee on Pharmaceutical Standards also decided not to include it in the Canadian Formularly. Yet it is undoubtedly efficient, and perhaps not more dangerous than amidopyrine (pyramidon), which has replaced it as an official drug. Phenacetin is not so dangerous, and phenazone is generally credited as being even less harmful. Acetylsalicylic acid is much less dangerous, but also much less efficient. Cinchophen lowers the fever and relieves the pain of acute articular rheumatism. Like the others, it may at times relieve the pain of chronic lesions in muscles and joints, but its use should be carefully controlled.

When the physician decides to employ any of these drugs he naturally inquires whether their dangerous effects on the heart and blood can be reduced. Long ago caffeine was suggested as an addition to remedies containing acetanilid and phenacetin. Two different conceptions may have underlain the suggestion. Firstly, that caffeine would counteract the gradual loss of cardiac tone which occurs if the administration is continued. This seems theoretically valid, for caffeine does increase cardiac tone. No adequate experiments have been performed to test this point, and such experiments in animals are difficult to design and carry out. Most text-books state that caffeine definitely increases the damage to the heart. This is based on experiments by Hale and others, in all of which such toxic doses were used that they are of no value, and, further, their experiments revealed such individual differences in the animals employed that only a much larger number than were used would justify a binding conclusion. The second suggestion was that caffeine would actually increase the central sedative effect. There is even less evidence in this point. Clinically, the habit of using the combination has persisted, and yet no analysis of clinical cases seems to have been made which either justifies the combination with caffeine or could be used to condemn it. The evidence for the use of sodium bicarbonate or other alkali with the antipyretic drugs is also drawn largely from relatively acutely toxic doses, but seems a little more credible than that for caffeine. Again, large doses of bicarbonate would have to be used to be of any value. It does, however, protect acetylsalicylic acid in the stomach.

Modern pharmacology has made great strides in its knowledge of synergists in combination. Starkenstein, the pharmacologist in Prague, called attention some years ago to the combination of amidopyrine and veronal. Scientific analysis of the action of this combination shows that the depression of pain is greater than with amidopyrine alone, and that the toxic effects of both drugs, so different in type, were reduced. A more extended study of such combinations by Loewe shows that the combination of equal amounts of phenacetin with barbitone (veronal) is even more effective, and the author has observed a case where this combination definitely relieved a minor, but definite, pain from a small indolent scalp abscess, when phenacetin alone did not.

Almost every proprietary house seems to have followed Starkenstein's lead and sells a combination of amidopyrine with its own particular brand of barbiturate. The scientific facts do not justify the underlying assumption that any barbiturate will be as effective as barbitone, and clinical evidence is wanting. Further, very many of the cases of agranulocytic leucopenia have been produced by the barbiturate amidopyrine combinations. The combination of phenacetin and barbitone might be more extensively tested.

Codeine has, as compared with morphine, little value in decreasing pain. Yet in certain

headaches it appears to be effective. Clinical experience, though perhaps not careful clinical testing, seems to justify the use of codeine in combination with the antipyretics. And its addition to phenacetin-barbitone may be found frequently to make the administration of morphine unnecessary. Such evidence as that of Slight, published recently in this *Journal*, shows that the constant use of codeine may lead to habituation, and indeed to addiction. It would indeed be inconvenient to the physicians at large were codeine to be included in the Schedule to the Opium and Narcotic Drugs Act. Consequently, the carelessness which has led some physicians to recommend to patients the purchase of codeine from a druggist is to be strongly deprecated. In most of the Provinces codeine is on the poison schedule, and consequently can only be sold on a physician's prescription. This should be universal, and care on the part of the physician should thus lead to there being no necessity for its being barred and placed under the restrictions of the Opium and Narcotic Drugs Act. Physicians resort to opium and morphine much too frequently for minor pain before having tried some of the combinations advocated above.

Acetylsalicylic acid is undoubtedly very ineffective in many cases. Probably most of its supposed effect is psychological rather than pharmacological. There is no reason to believe that when added to phenacetin, phenazone or amidopyrine, it does anything more than add its small quota to the effects of the other drugs, while the addition of barbitone apparently more than doubles their efficiency.

Many headache remedies are put up in tablet form by the manufacturer. Many of these contain the more dangerous acetanilid, on account of its small dose. Those that contain phenacetin rarely have more than 2½ grains, which is usually an entirely inadequate amount. When they contain caffeine the amount is rarely larger than one grain, which, when one considers the daily consumption of this drug in tea and coffee, is again a ridiculously small amount. When codeine is added, again the usual dose is ¼ grain. One finds not infrequently the addition of such extraordinary substances as gelsemium. This may provide a talking point for the sales agent to the uneducated physician, but not anything else. When sodium bicarbonate is added the dose will be one grain or even less. This is entirely futile, as any thinking physician can readily see. Most of these tablets sold to the prescribing physician for his use are unwise in their composition and must be inefficient, unless two or more are taken. Nor has the physician any assurance that they contain what they purport to do. The administration of the Food and Drugs Act is so ill-supplied with funds that it is impossible for them to check even a fraction of the numberless pills and tablets recommended to physicians. The manufacturing houses should not be permitted to place on the market and beguile physicians into using any combination that may occur to the minds of their staff. Such preparations should be made only by a conscientious, well-trained and registered pharmacist, and not by a handy man. In order to protect the reputation of the medical profession we should use, when we require them, drugs of known potency and in adequate amounts. There is little doubt that the public's suspicion that we do not know how to cure is largely due to the character and quantity of the drugs prescribed by many members of the profession.

COLOUR CAMERAS TO RECORD THE HUMAN EYES FOR SCIENCE.—By having colour cameras look into human eyes, Harvard anthropologists are perfecting a new weapon for discovering the mechanics of heredity in human eye characteristics. The problem of measuring eye pigmentation and pattern by use of colour photography was initiated by Dr. Laurence D. Redway, formerly research associate at the Peabody Museum at Harvard, and it is now carried on by Edward Hertzberg, graduate student in anthropology. Seeking information concerning man's physical makeup, science can make accurate measurements of many features including height, head length and facial width. Many other individual characteristics, such as shape and slope of the forehead, colour of the hair, and colour and pattern of the eye, cannot yet be accurately determined. Relatively crude estimates of these, all tinged with the troublesome personal equation, are most unsatisfactory and it is to develop new and accurate measurements that the present work has been undertaken. Search for a satisfactory method of recording has begun. The next step will be to find a method of measuring and expressing the actual colour values of the colour photographic plate. With these problems solved, science has a powerful new weapon for a third step, that of learning the mechanics of heredity involved in the transmission of eye characteristics.—*Science News Letter*, 1935, **27**: 289.

THE PHYSIO-PATHOLOGY OF SIMULTANEOUS BILATERAL PNEUMOTHORAX*

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SIMULTANEOUS bilateral pneumothorax has its point of departure and its warrant in the therapeutic action of *hypotensive pneumothorax* (*i.e.*, non-compressive), in contradistinction to the classic, compressive, pneumothorax of Forlanini, the only form known and accepted in his time. The conception of simultaneous bilateral pneumothorax was considered then a scientific heresy. Twenty years were required for the method to quietly make its way. The physio-pathological foundations are as follows.

It is generally accepted that the insufflation of gas into a pleural cavity is followed by a more or less marked limitation of respiratory movements in the corresponding lung, and that the deficiency is compensated for by wider excursions of the opposite lung, acting vicariously. This is not the case, however. Ordinarily, the respiratory excursions take place both sides of the so-called intermediate position of Bohr (median pulmonary elastic tension). When one blows gas in moderate quantity into a pleural cavity Bohr's mean is lessened and is reduced to the same degree in one or the other direction. All such modifications occur at the expense of the reserve air.

But the insufflation of gas brings about still another important consequence. While the visceral pleura maintains its contact with the parietal pleura the lung is obliged to follow completely the movements of the thoracic cage; the respiratory "traumatism" affects the healthy and diseased areas equally; these latter, being less distensible, are liable to be more easily torn. The separation of the pleural leaves by a layer of gas, however slight, is sufficient to do away with the partnership, and release the lung from its "fatal servitude". Once the adhesion to the parietal wall is done away with by the pressure of gas and the lung is no longer obliged to follow slavishly the movements of the thoracic cage, the diminution in expansibility becomes henceforth unobjectionable and, moreover, is an advantage, as it assures a relative degree of rest to the infiltrated areas because of their lessened distensibility. When conditions are favourable it is easy to verify with the fluorescent screen this "Morgan effect", so-called after the observer who in 1913 supplied the experimental proof of this conception.

If the relative degree of rest is the direct and immediate consequence of the presence of gas in the pleural cavity the "elective collapse" of the infiltrated areas is only established at a later date and with different modalities. The sudden and marked increase in endo-pleural pressure which takes place with each attack of coughing provokes the expulsion of a certain amount of air and exudation; in the inspiration that follows the areas which are infiltrated and, in consequence, less distensible do not re-expand in the same degree as the healthy tissues. The repetition of this phenomenon leads definitely to the complete elimination of the products of exudation, already less in evidence, and to a favourable transformation, that is to say, a superficial position for the foci and their concomitant zones of extension, and the integrity of the inter-lobar fissures, which assures the independence, radiologically considered, of each lobe (Sergent). It is even possible to verify on the screen the collapse of a whole lobe ("collapsus lobaire" of Rist and Ameuille, and of Sergent).

The fundamental elements in the homolateral therapeutic mechanism in hypotensive pneumothorax are (1) the elimination of the respiratory traumatism; (2) the utilization of the differences in elasticity between the healthy and diseased areas; and (3) elective collapse.

* A paper read at the Annual Meeting, Canadian Tuberculosis Association, Montreal, June 13, 1934.

THE CONTRA-LATERAL MANŒUVRE

Let us now consider the contra-lateral manœuvre, a clinical conception which we owe to Forlanini. The mediastinum is a partition movable in the sagittal direction, the position of which is governed by the relationship of the endopleural pressures, which are exactly equal under physiological conditions. If the pressure is increased, that is to say, becomes negative on one side, because of, for instance, the pressure of gas, the opposite side, because of the preponderance of the attraction exerted by that pressure, responds to the point of re-establishing the equilibrium of the pressures. The modifications of the pleural pressure are expressed contra-laterally, being carried over to the opposite side by the mediastinum which is displaced. As a final result the increase in endopleural pressure and the consequent restraint on the parenchyma of the lungs become bilateral. Epiphanio found this to be the case in the course of his radiological studies. He demonstrated that the opposite lung, far from assuming vicarious function, manifested, on the contrary, a volume more or less diminished in proportion to the displacement suffered by the mediastinum. Following Parodi, let us emphasize in this connection that the harsh respiration heard on auscultation of the opposite side does not indicate, as one commonly understands it, a deeper and vicarious respiration, but, on the contrary, is the sign of a diminution in expansion resulting from a condensation of the parenchyma, a condensation to which the contra-lateral lung is also subjected, though in less degree.

Granted that a monolateral pneumothorax can exert a bilateral influence, we are justified in asking whether simultaneous bilateral pneumothorax has any warrant. The answer is "Yes", and for this reason. First of all, the contra-lateral effect is indirect and conditioned by the various physiological and pathological possibilities of mediastinal displacement (there is no effect when the mediastinum is fixed); secondly the contra-lateral effect is less, because, when the mediastinum has reached the limit of its physiological mobility, the contra-lateral pressure does not rise parallel to the pressure on the inflated side. In addition to which, the contra-lateral effect is incomplete, since of the three factors confronting us one only, that is, the lessening of inspiratory traumatism, is in operation, whilst the Morgan phenomenon and elective collapse are completely lacking from the moment when contact between the pleural layers on the contra-lateral side has become effective.

SIMULTANEOUS BILATERAL PNEUMOTHORAX

Once the problem is presented in this way, a corollary may be deduced to which clinical observation has already led us. The field of application *par excellence* of simultaneous bilateral pneumothorax is represented by a *pneumothorax subsidiary to a monolateral pneumothorax attended by an insufficient contra-lateral effect;* let us add that this indication is opposed by a second fundamental consideration, namely, the numbers of lesions in the opposite lung when a monolateral pneumothorax has been effected. Apart from several rather rare indications, to wit, hæmostatic pneumothorax, supporting contra-lateral pneumothorax, in view of the disturbances caused by displacement of the mediastinum, and cases of insidious, imperceptible infection (post-partum pneumothorax of Sergent; recent lobitis of Léon Bernard; and very early bilateral infiltrations), simultaneous bilateral pneumothorax finds its greatest and most appropriate rôle as a subsidiary measure in cases where other forms of treatment, direct or indirect, have failed of effect.

According to an approximate estimate of Liebermeister at least 50 per cent of patients will be adjudged suitable for monolateral collapse treatments in view of the practicability of eventual bilateral intervention, whilst, according to the classical indications, only from 4 to 8 per cent would be benefited by it. Even allowing for the optimism of this eminent authority on tuberculosis, and reducing these percentages as much as one thinks proper, it cannot be gainsayed that there is an important gain.

Bilateral pneumothorax falls into two main classes:—

1. A monolateral intervention has been carried out on the side most affected; then, if, after a certain time the opposite lung does not show any clear signs of improvement as a result of the original pneumothorax, or, again, a fresh evolution becomes manifest on the opposite side,

in that case we should institute a bilateral pneumothorax by reason of alternate indications.

2. In bilateral lobitis of the apices, in circumscribed, bilateral, ulcero-caseous tuberculosis, above all, in incipient bilateral infiltrations, we can institute early simultaneous bilateral pneumothorax, for then all, as in the case of acute and subacute infiltrating or broncho-pneumonic exudations, lend themselves very well to this form of collapse therapy.

What is the future of simultaneous bilateral pneumothorax?

In conformity with these conceptions we are of the opinion that the advantages and the future of simultaneous bilateral pneumothorax are not bound up with any extension of the indications for this procedure. We do not feel that pity should take the place of technical considerations, and that we should have recourse to simultaneous bilateral pneumothorax in desperation in cases with multiple cavities exceedingly advanced and endowed with very feeble powers of adaptation. For the few, very rare, cases in which an unhoped-for success has been obtained there are many in which there are great disappointments.

The distrust with which certain authors have received simultaneous bilateral pneumothorax is explained in part by the fear of complications, among which rupture of the lung and acute and subacute anoxæmic states are the most formidable. Rupture is, without any doubt, a serious accident, but its greater frequency in connection with double collapse therapy, which some authorities have alleged, is only apparent (Burnand; Léon Bernard) since every case of simultaneous bilateral pneumothorax is actually two pneumothoraces.

It is clear that the frequency of rupture is strictly related to the great or less ease with which the indications can be established. Only on this ground can we explain the considerable differences in the percentages reported (17 in 116 cases reported by Coulaud; 2 only in 112, by Liebermeister). These complications, in spite of their gravity, only justify in part the pessimism with which they have been viewed. Clinical experience has shown that, apart from the formation of fistulæ or the rupture of cavities, events which, happily, are rare, simultaneous pneumothorax is attended with comparatively slight risk and can, in fact, often be utilized in the continuation of treatment. As for the danger from anoxæmia, this has been decidedly exaggerated.

It is not difficult to avoid these accidents, either by properly regulating the pressure and the sequence of the insufflations, or, particularly, by having recourse to radiological control, which, indeed, is an indispensable procedure (Terrasse), and to the examination of the functional powers of the respiratory apparatus, as outlined by Dumarest and Delong and introduced into clinical practice by Liebermeister. Lucacer has shown that each successive intrathoracic insufflation is attended by numerous repercussions on the respiratory and circulatory functions which are by no means negligible. The organism then undergoes a test of resistance when it is called upon to right these various disturbances of equilibrium. In simultaneous bilateral pneumothorax the compensatory reactions are less prompt, and in consequence the upsets in equilibrium are more prolonged.

THE RESULTS OF SIMULTANEOUS BILATERAL PNEUMOTHORAX

It need hardly be said that one ought to appraise the results of simultaneous bilateral pneumothorax in respect to the object that one has in view, that is to say, whether this is clinical cure or merely an amelioration of the symptoms. The quality of the results, then, is a function of the strictness of the criteria which we regard as indications. The more extensive these are, the less favourable are the statistics, no matter what is the character of the intervention. Consequently, one is scarcely warranted in formulating general conclusions or in establishing an average figure from the statistics available at the present time, derived from 1,000 cases reported by more than three hundred authors; for the condition indispensable for the legitimacy of such a procedure, that is to say, the identity of the criteria of choice and interpretation, cannot be realized at a time when the treatment under discussion is still on trial. According to Liebermeister, who reports 100 cases, of which 90 were with cavities, when a good bilateral collapse had been obtained, the number of cases which became bacillus-free rose to 50 per cent, and the

number of cures, to about 40 per cent. Sachs, Walter, and Hoth have drawn up a comparative statement of the results obtained in patients subjected to simultaneous bilateral pneumothorax and in others not so treated, by reason of technical difficulties or refusal to permit the operation. We can accept that the two groups were comparable from the clinical point of view (lesions, general condition, sanatorium control, etc.).

TABLE I

	Treated cases	*Untreated cases*
Those who became bacillus-free....	71.8	0.0
Normal sedimentation rate.....	39.1	0.0
An improved sedimentation rate...	95.0	66.0
Again able to work (the patients were for the most part office employees)	51.3	0.0

These figures cover a period of four years of observation.

Recently, Roloff has analyzed the end-results of collapse-therapy in 1,128 cases followed for twelve years. He found excellent therapeutic results in 29.4 per cent of cases of monolateral pneumothorax and in 19.4 per cent of cases of simultaneous bilateral pneumothorax. In Léon Bernard's clinic Triboulet obtained favourable results in a third of the cases treated.

In summing up, we can conclude that simultaneous bilateral pneumothorax in the treatment of tuberculosis has come to stay. Nevertheless, we are of the opinion that an excessive extension of the indications for it will only compromise its future. At the present, and with rare exceptions, its application should be confined to institutions (sanatoria, clinics and hospitals) properly equipped, and entrusted only to medical men familiar with all the details and intricacies of artificial pneumothorax.

The following are illustrative cases.

CASE 1

A girl, eleven years old, came into our service on May 23, 1932, with cavitation of the right apex of a very few months' standing. She was running a temperature and her sputum was positive for tubercle bacilli. On June 1, 1932, pneumothorax was induced on the right side, which after the first insufflations was elective and brought about collapse of the upper lobe. Three months later, only traces of the cavity could be detected. On October 19, 1932, some five months later, the case became complicated by effusion and it became necessary to take away 1,500 c.c. of fluid and replace them with 1,000 c.c. of air. The fluid did not again collect, but in May, 1933, a focus of infection made its appearance in the left apex, with a return of the pyrexia and the Koch bacillus in the expectoration. On July 20, 1933, pneumothorax was induced on the left side, which again brought about, at one and the same time, disappearance of cough, expectoration, and temperature. This patient now presents slight dyspnœa, due, we consider, to the thickening and rigidity of the right pleura, where in order to prevent adhesion, we found it necessary to keep up a slight positive pressure with 150 to 200 c.c. of air. Nevertheless, the patient is very well and has gained fifteen pounds since her second experience.

CASE 2

Mme. E.C., 21 years of age, with an involvement of the right upper lobe dating back about four months. She had a temperature and the tubercle bacillus was found in the sputum. August 4, 1931; a right-sided pneumothorax was induced, which did not prove entirely satisfactory. The temperature fell, but the expectoration contained bacilli for about four months. On December 10, 1931, the patient was discharged. A cavity was still evident at the apex but her general condition was excellent, and she promised to follow out the prescribed treatment. February 21, 1933, in spite of the advice of her physician she got married. She did not receive any reinsufflations for two months. In March, 1933, she became pregnant. On December 20, 1933, she had a normal confinement. Her physician, having discovered a new lesion on the left side returned her to our service on February 2, 1934. Examination revealed slight dullness over the right apex, in front and behind, with numerous crepitations during both phases of respiration. February 6, 1934, pneumothorax was induced on the left side. The cough again disappeared and the expectoration which had been positive for some months now became negative and remained so. The patient was discharged on May 16, 1934. She returned to the out-door department, promising to carry out her treatment more faithfully. We are sure that she has learned her lesson.

CASE 3

Mlle. B.H., aged 22 years, was admitted to my service on April 18, 1932, with advancing ulcerous tuberculosis involving almost the whole of the left lung. On August 26, 1932, pneumothorax was induced on the left side, which produced from the start an excellent collapse and a fall in the temperature for about two months. July 3-, 1932, saw a return of the temperature, which rose to 101 or 102°, and the number of tubercle bacilli reached 200 to 300 per field. On August 10, 1932, pneumothorax was produced on the right side. Again the temperature disappeared. The sputum by October 12th had become negative and has remained so up to the present.

Occasionally, some troublesome features arose. On October 1, 1932, fluid appeared on the left side and we were obliged to tap five months later because of displacement of the mediastinum. Twelve hundred c.c. were removed and the fluid did not again accumulate. Then, on two separate occasions, after reinsufflation of 300 to 400 c.c. on the right side, the patient was seized with attacks of suffocation which, on each occasion were quieted by the removal of 1,500 to 1,600 c.c. of air. Since June, 1933, (that is, for one year) there has been no other untoward event. The patient has become an out-door patient and comes regularly for her insufflations. She does not cough and has even added twenty pounds to her original weight (116½ lbs.).

Case Reports

THE ANTIDOTAL EFFECT OF ANGER IN A CASE OF INSULIN REACTION (HYPOGLYCÆMIA) IN A DIABETIC*

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The following case report is presented because it exemplifies clinically the possible influence of anger on the adrenal glands, as identified by an ameliorative effect on the symptoms resulting from a hypoglycæmia. It also illustrates the inconvenience, hazard and chagrin to which some diabetics are exposed.

(Case 79110, Pennsylvania Hospital). A male, aged 39, height 5 feet 4 inches, and weighing 58 kilograms, was first known to have diabetes in July, 1932. It was controlled (no glycosuria and the blood sugar 0.159 per cent [Benedict] I hour after breakfast) with a diet of protein, 90 grams; fat, 71 grams; carbohydrate, 125 grams (1,500 calories); and with insulin, 45 units, given in 4 doses. The diabetes was moderately severe and there was an unusually narrow margin of safety between hyper- and hypoglycæmia.

At noon on April 1, 1934, the patient, having had an active morning, noticed while walking that he was losing the power of his legs. He recognized this, from past experiences, as a premonitory sign of a severe insulin reaction. Weakness, perspiration and hunger also became noticeable.

He entered a restaurant, purchased some food, carried it to and placed it on a table, but before partaking of it, his legs gave away and he collapsed on the floor. He was unable to rise. Believing him to be intoxicated, two attendants threw him out rather roughly. Several bruises gave evidence of this treatment and his resistance to it. His clothes were torn and several buttons were missing from his vest. By this time his anger was aroused, and he was further enraged when a police officer sent for a police wagon. At this point his symptoms began to subside. He regained an upright posture without assistance; he presented the officer with his diabetic identification card. He returned with the officer to the restaurant, had his money refunded, and proceeded, unaided, about one-half of a city block to another restaurant where he obtained some orange juice.

It seems probable that the relief from symptoms without aid, and at a time when such a recovery would be improbable, was due to increased secretion of the adrenal glands as a result of anger.

*From the service of Dr. Thomas McCrae, Pennsylvania Hospital.

A CASE OF RUPTURE OF THE UTERUS WITH HYSTERECTOMY FOLLOWING PREVIOUS CÆSAREAN SECTION

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The patient, aged 35 years, with a good clinical history, had her first delivery nearly three years ago. A Cæsarean section with vaginal drain was performed, to relieve an impacted breech presentation in her flat pelvis. On the third day after operation she had a sudden chill: the temperature reached 106° in the morning, but reverted to 98.4° at night. Two days later the patient complained of pain in the right femoral region, due to a phlebitis which we concluded was the likely cause of the preceding chill. There was no infection of the abdominal wound. Eventually she developed an extensive thrombo-phlebitis in the left internal saphenous vein and in the right arm above the elbow, and shoulder pain, during which time she maintained a moderate elevation of temperature, necessitating 51 days' sojourn in the hospital.

Her history preceding the delivery in question had been comparatively normal, with the exception of some throat discomfort and the presence of injected right popliteal varicose veins. Her last period was on May 18th, 1933; labour was expected on February 22, 1934.

At midnight on February 16, 1934, the patient, shortly after retiring, suddenly felt a peculiar lower front abdominal sensation "like a tearing", followed by a period of "intense

agony'' which compelled her to get out of bed ''on all fours''. She said she was ''all stiffened up and unable to walk''. She was carried to the ambulance suffering excruciating pain. On admission to the Ottawa Civic Hospital at 1.20 a.m., the maternity night supervisor reported the pains as ''lasting peculiarly long''. When I saw the patient shortly after, she was not suffering extraordinarily. ''The pain was all in the front of the abdomen with some in the back''. The abdomen was firm. The fetal heart sounds were absent. Examination revealed no presenting part, no dilatation, no vaginal bleeding. The temperature was 97.2°, pulse 100, respirations 24. The appearance of the patient did not suggest anything abnormal. On account of the previous Cæsarean section, with a flat pelvis and an unengaged presenting part, section was decided upon, and the patient was prepared accordingly.

At operation under gas at 3.23 a.m. the old scar was excised, and, on opening the abdomen, I was astonished to come down on placental tissue, omentum, scattered organized blood clots and membranes, through which my hand delivered a dead fetus, a male of 6 lbs. 11½ ozs. The case now suggested an abdominal pregnancy, and the possibility of excessive hæmorrhage from the placental site loomed up. On exploring, about half the placenta was found to have been expelled from the womb, and the other half gradually peeled off, exposing a gaping uterus, laid wide open for about 7 inches from the fundus to the lower uterine segment, and now firmly contracted down. Supra-vaginal hysterectomy was decided upon immediately and carried out in a reasonably short time, although we were hampered somewhat by many small bleeding points. A vaginal drain from the pelvis was inserted, and a second left in the lower pole of the abdominal closure. The patient was given intravenous glucose on the table and stimulants hypodermically. Her condition was none too promising on returning to her room, where we gave her hæmostatic serum and further stimulation for a rapid pulse of poor volume. At 10.15 a.m. she was transfused with 500 c.c. of blood, after which she improved. At night she received 750 c.c. of 10 per cent glucose intravenously, together with a blood bactericidal agent of 10 c.c. Next day she was given additional glucose intravenously. Her white blood cells were 11,750. Two days after operation she was given a second blood transfusion of 350 c.c. from a different donor, when she showed remarkable improvement. For the next three days she received intravenous glucose, plus the blood bactericidal agent every second day. On the third day after operation, she had soft diet, and after the sixth day (when her blood picture was red blood cells, 2,780,000; white blood cells, 11,600; hæmoglobin, 60 per cent) light diet was continued. The moderate discharge from the abdominal wound was sero-purulent. On the twenty-third day after operation (red blood cells, 4,600,000, and hæmoglobin, 70 per cent) she was discharged in excellent condition, except for the presence of a little pain and slight tenderness over the femoral regions and in the left calf. At no time during the post-operative period had her temperature risen above 99.4°.

The patient made an unexpected recovery; at operation the presence of free blood clots, partly extruded placenta, and a gaping ruptured uterus, with no special vaginal preparation, presented a tragic situation with poor prognosis. In this second pregnancy the absence of any suggestion of hæmorrhage or shock, together with absence of any great pain after admission to hospital, due to fetal expulsion and a quiescent uterus, was as remarkable as it was misleading. In her previous Cæsarean post-partum period the elevated temperature with chills undoubtedly signified infection, which weakened the uterine wound and caused her extensive phlebitis. Her phenomenal recovery was undoubtedly very favourably influenced by blood transfusions, intravenous glucose, and prophylactic blood bactericidal, assisted by continuous postural drainage and tonics.

A CASE OF CANCER OF THE CERVIX TREATED BY WERTHEIM'S HYSTERECTOMY: SIX-YEAR CURE*

BY H. W. JOHNSTON,

Toronto

Mrs. M., aged fifty-two, was referred to me on January 3, 1929. She gave a history of hæmor-

* Reported before the Section of Obstetrics and Gynæcology, Academy of Medicine, Toronto, March 7, 1935.

rhage after the menopause. The bleeding had only been of six weeks' duration. Examination disclosed a small erosion with a suspicious area. On January 4th I did a biopsy of the cervix and cauterized the whole cervix thoroughly. The sections showed a squamous-celled cancer with many pearls and solid cords of epithelium. On January 7th I performed Wertheim's hysterectomy. Examination of the specimen showed no glandular or broad-ligament involvement. The patient made a good recovery . I saw her last on February 8th, of this year. The pelvis was clear. She had put on ten pounds in weight and looked very well.

The primary mortality in radical operation for carcinoma of the cervix, according to Bonney, is 6.3 per cent for early cases and 23.1 for advanced cases. Of course the primary mortality depends considerably upon the extent of the operation performed. The removal of the glands increases this risk somewhat, but 40 per cent of all Bonny's cases operated upon showed glandular involvement. In reckoning his five-year cures, of the 154 cases showing glandular involvement, 33 patients were alive and well five years after the operation—a cure rate of 22.6 per cent, as compared with a cure rate of 55 per cent in those showing no glandular involvement. However, if operation had not been performed, I think we are safe in saying that the 33 patients would not have been salvaged from the wreck, and this is a tribute to the surgeon, the operation, and to this method of dealing with malignant disease of the cervix.

A CASE OF CONGENITAL DIAPHRAGMATIC HERNIA

By J. STUART DALY, B.A., M.D., C.M.,

Trail–Rossland Clinic,

Trail, B.C.

This is the case history of a male child which lived eight hours with all the intraperitoneal abdominal viscera in the thoracic cavity except the liver and sigmoid.

The family history was negative. The parents had been married one year and this was the first child.

The labour was normal, the second stage slightly prolonged but no forceps were used. The fetal heart was between 120 and 140 during the whole of the labour. The child's colour was good at birth but it did not cry properly, merely whimpered. The respirations were rapid and the movement of the chest attracted immediate attention. The anterior chest wall seemed to rise up to a rounded lump and the upper part of the abdomen to retract on inspiration. It was not like abdominal breathing, but as if all the muscles of inspiration were working to draw air into the lungs. Occasionally there were spasmodic attacks during which the respirations would cease for twenty to thirty seconds. On percussion over the thorax there was a tympanitic note over the left side, anteriorly and posteriorly, but the right was relatively dull. On auscultation no breath sounds could be heard on the left side, while on the right the sounds were faint and distant and moist râles were noted. The heart was heard on the right of the sternum, presented a normal rate (120); no murmurs.

The child voided soon after birth and passed meconium several times.

A diagnosis of atelectasis and dextrocardia was made, and the child given oxygen through a gas-oxygen mask. The colour kept fairly good, but it soon became evident that he was losing ground and he died eight hours after birth.

An autopsy was performed 12 hours later. The body was that of a new-born male child, well developed, and with no external abnormalities.

The chest was opened up in the usual manner and lying in the pleural cavity were the coils of small bowel. On closer examination it was found that the anterior part of the thoracic cavity was entirely taken up by the stomach, large and small bowel, and spleen. No sign of heart or lungs could be seen until these were removed. The heart was then seen on the right. The right lung was small and entirely posterior, while the left lung was pushed up into the apex of the pleural cavity. The thymus was normal in size and position. There was a congenital absence of the posterior part of the left diaphragm, through which the large bowel entered the abdominal cavity and was continuous with the sigmoid and rectum.

The heart was normal in size, but there were two vessels arising from the left ventricle. The

larger, to the left was the aorta, the smaller was the right innominate. Unfortunately, the specimen was not preserved. The right lung was lying in the upper posterior part of the pleural cavity and measured 2½ by 1½ inches. It was aerated in places. The left lung was even smaller, and was pushed up into the left apex of the thoracic cavity. Both lungs floated in water.

The abdominal cavity was then opened and was found to be completely filled with a very large liver. There was a sulcus or groove between the two lobes, the left being as large as the right, each lobe reaching down into the pelvis. Both kidneys were normal. Behind the left lobe the descending colon emerged from the thoracic cavity and joined the sigmoid.

It is interesting to speculate as to the probable sequence of events here. We are assuming that there was primarily a failure of development of the major part of the left diaphragm, allowing the abdominal viscera to enter the thorax, displacing the heart to the right and so interfering with the circulation as to create a passive congestion in the liver and consequent increase in size of the latter.

Clinical and Laboratory Notes

APOMORPHIA HYDROCHLORIDE

BY D. P. ANDERSON,

Montreal

We have all, no doubt, read a few lines in our materia medica about a drug called apomorphine, and have rested satisfied with the knowledge that this drug, if given in proper doses, will produce vomiting. But at this point our search after knowledge of this drug ceases to interest most of us. Some years ago I had occasion to use apomorphia hydrochloride hypodermically on a valuable dog, who had within the hour eaten something which he picked up on the street, and who presented all the symptoms of acute strychnine poisoning. I was fully prepared for the emetic action which took place within a few moments after the hypodermic administration of one-tenth of a grain, but I was hardly prepared for the subsequent course of events. Immediately after vomiting the dog became quite quiet and absolutely free from any further spasms, and within a few hours he showed no ill effects from either the strychnine or apomorphia. Within a short period of time I was fortunate in saving four other dogs who had been poisoned with strychnine. From this experience I have concluded that we had here a valuable antidote for strychnine poisoning, but as I have never had the opportunity of treating a human subject with acute strychnine poisoning I must not speak too definitely on this point.

The marked and prompt sedative action encouraged me to continue my investigation further, and I was fully recompensed.

Cases of acute or chronic alcoholism, especially those associated with delirium tremens, seemed to me to offer a good field for the use of apomorphia. I therefore began with the hypodermic administration of apomorphia hydrochloride in doses of gr. 1/30. This dose produced in the majority of the cases an initial nausea, with oftentimes vomiting, but these symptoms were very quickly followed by the most marvellous sedative effects and the patients slept calmly for hours and awakened without either hallucinations or delirium, and, in the majority of cases, without any desire for alcohol, in some cases actually with even a dislike to the taste of alcohol. I feared to produce some serious effect on hearts already weakened by overindulgence, and for this reason, I further experimented with dosage. I finally found that with doses of gr. 1/50 I could produce a slight nausea followed by the sedative action which I had obtained with the larger doses. This then gave me a greater sense of security, especially as no symptoms of any toxic nature were met with.

Having obtained such happy results I ventured further afield. The next step was to combine this drug with hyoscine hydrobromide, in the hope of relieving such distressing conditions as angina pectoris and asthma. I therefore compounded a hypodermic tablet, which I named H.A. triturates, made up of hyoscine hydrobromide, gr. 1/400, and apomorphia hydrochloride, gr. 1/200. The advantages were the ease with which these triturates could be carried about with the patient in very small containers, and, further, the rapid action which could be obtained by placing one or two of these triturates under the tongue. The action was almost as prompt as that obtained by hypodermic administration. My expectations were fully realized, as I got better relief in both of these diseases. There seems, too, no tendency to produce any habit. In my clinic at the Montreal Children's Hospital I have used these triturates, with absolute freedom from any untoward symptoms, for years in

cases of enuresis, especially those of nervous origin, with happy results. Of late I have administered these triturates in cases of paralysis agitans, in the hope that the spasticity might be alleviated, and I feel that I am justified in my choice of a sedative which can, with perfect safety, be administered for long periods of time.

The attention of scientific investigators should be turned to a fuller study of this remarkable drug.

Editorial

THE ANNUAL MEETING

THE Annual Meeting at Atlantic City has come and gone, as annual meetings have a way of doing, and is now nothing more than a pleasant memory. Yet, not altogether so, for impressions are lasting and it would be hard indeed to attend such a gathering in receptive mood and not carry back much of permanent value. In our opinion the convention was a pronounced success. It was also historic, for, for the first time the national Medical Associations of the United States and Canada joined forces. Those of us belonging to the smaller body may have had misgivings as to the outcome of such a bold experiment. But, if so, we need not have worried. Our Canadian contributors gave of their best, and that best was excellently good. They were treated generously by our American confrères in that they were allotted more than their proportionate share of the program. Many of the big men of the United States and Canada were there, and it was a privilege to jostle shoulders with them in the elevators and listen to their words of wisdom (elsewhere, of course!). The occasion, also, was graced by the presence of invited guests from the Home Land, and we welcomed Sir Francis Shipway, Mr. Leslie Paton, and Mr. Norman Patterson, of London.

It is hard to describe the meeting in adequate terms. In brief, the impression one gathered was that of immensity coupled with efficiency. The entire complicated machinery worked smoothly and without apparent effort, due to months of skilful planning. More than eight thousand American and three hundred Canadian members were registered, not including wives and relatives and other guests. In addition to the convention booklet, which contained the names of all the officers of both Associations, lists of committees, the program, abstracts of the papers presented, and the entertainments, and much other information, a daily bulletin was issued, in which could be found the important announcements relating to the day's work, with a list of those registering, and "finger-posts" pointing to certain of the exhibits. Thus, it was possible at all times to keep fully informed of what was going on. On the first two days, while the House of Delegates of the American Association and the Council of the Canadian Association were deliberating over their problems, general scientific assemblies were conducted, dealing with topics of current interest to the members at large. More than three hundred and fifty papers were contributed to the program, covering every aspect of current medical science. Noteworthy was the program of the Section of Surgery, the earlier part of which was designed to set forth the relationship of physiology to advancement in surgery and, particularly, to review our knowledge of hæmatology and immunology as they bear upon that special field, a line of thought somewhat unusual in the premises. Attention should also be called to a special program provided by the Section of Physiology and Pathology, in which certain of the founders of that Section, namely, Drs. Ludvig Hektoen, Walter L. Bierring, James B. Herrick, George Blumer, and Simon Flexner, provided a retrospect of the advance of medicine during the last twenty-five years, as based on scientific research. Other noteworthy features were the sessions on Anæsthesia, Military Medicine, and the History of Medicine.

Without intending to detract from the merits of the scientific program, which was indeed excellent, one is inclined to give the palm to the scientific and commercial exhibits. It was, of course, impossible to take in a tithe of what was provided, but if one

had confined himself to a study of what was presented to his eyes and ears in the great auditorium of the Convention Hall and had never gone near the sectional meetings he could have carried away much of value. The display was, in short, a liberal education. Each of the regular Sections sponsored an exhibit, many units of which illustrated papers presented before it. One item that attracted much interest was the life history of the Dionne quintuplets, and Dr. A. R. Dafoe, who was present, received special honour, being elected an Honorary Member of the Canadian Medical Association, and being presented at the inaugural meeting of the two Associations on the second evening. Among the outstanding exhibits were those on Nutrition, on Diabetes, on the Prevention of Asphyxial Deaths, and on Vaccines and Serums. The scientific material presented was of great variety, of high quality, and, in many cases, "well composed," like a good picture. Frequently, pathological specimens, moulures, photographs, drawings, charts and such like, illustrating some particular subject, were grouped harmoniously together. It is gratifying to find that the Canadians were in the running here also. The Silver Medal in Class Two was awarded to Drs. D. W. MacKenzie and A. B. Wallace, of the Urological Department of McGill University and the Royal Victoria Hospital, Montreal, for their exhibit showing the relation of the lymphatics of urinary and genital tracts to renal infections. Their celluloso-corrosion preparations were striking and, indeed, singularly beautiful. Then, Dr. T. G. H. Drake, of the Hospital for Sick Children, Toronto, received a Certificate of Merit in Class Two for the excellence of his exhibit illustrating the Care and Feeding of Infants in Ancient Times. And Honorable Mention was granted to Dr. Maude E. Abbott for her exhibit illustrating the Clinical Classification of Congenital Heart Disease.

The commercial exhibits were almost endless. Tempting wares were offered to the physician, and all the resources of modern science were employed to display them effectively. Books, instruments, drugs, sera, vaccines, cosmetics, vitamins, prepared foods, were there, and much else. Pictures, wax models, "movies", plain and in colour, "talkies" and demonstrations of all kinds added also to the interest.

The social side was much in evidence. Noteworthy was the luncheon given by the Executive of the Canadian Medical Association at which the retiring President, Dr. J. S. McEachern, delivered his valedictory and inducted Dr. J. C. Meakins, his successor. To this luncheon the officers of the American Association and some other guests were invited, and the opportunity was taken to signalize the occasion of the dual meeting by presenting the President of the American Association, Dr. Walter Bierring, with a gavel of office. Much interest was attached to this gift. The head of the gavel was made from British oak, taken from one of the supporting piles of old London Bridge. This wood had been placed in position in the year 1098 and had been under water until 1832. The handle of the mace was made of American walnut, fashioned after the model of an old Egyptian mallet. The inscriptions were engraved on Canadian silver. Thus were typified authority, law and order, and friendship. The new gavel was used later by the President of the American Medical Association when installing his successor, Dr. J. S. McLester.

The officers and House of Delegates of the American Association also entertained the Executive of the Canadian Association at a pleasant luncheon. And, the officers and Executive of the Canadian Association were entertained very hospitably by the Medical Societies of New Jersey and Atlantic City. The reception given to the new president of the American Medical Association, at which the Canadian officers and their wives assisted, was a most happy function, and afforded opportunity to renew many old friendships.

Altogether, the convention was a great success. We have to thank our American confrères for many kind acts of thoughtfulness and for their gracious hospitality. The idea of fraternity was in the ascendant at all times. We trust that it may be our privilege to entertain the American Medical Association in Canada in the not too distant future. We shall live in hope. A. G. N.

PAINS AND ACHES

PAIN, while undoubtedly a valuable signal post, as indicating danger, is from the point of view of the sufferer an undesirable evil. Pain is often also undesirable for medical reasons. The medical practitioner who relieves pain safely and promptly not only does his duty but thereby ensures his popularity. That he does not always relieve pain when he could and should is one reason why patients desert him for the osteopath or chiropractor. This truth is well exemplified in connection with certain familiar pains and aches which are apt to beset the old, but from which no age is exempt. That they are obscure in nature and origin is indicated by the many names which have been attached to them — fibrositis, myalgia, myositis, "muscular rheumatism", neuritis, neuralgia, "growing pains", arthritis, peri-arthritis; and, according to regional occurrence, "trigeminal" neuralgia, occipital neuralgia ("rheumatic headache"), torticollis, brachial neuralgia, pleurodynia, lumbago, and sciatica. These varied terms, it is clear, frequently designate symptoms rather than diseases, and suggest a not altogether defensible etiology.

When the medical man is confronted with one of the cases of obscure pain it is not sufficient for him to tag it with one of these names that sound so well and mean so little, and to prescribe aspirin, a salicylate mixture, or a liniment, and let it go at that. This is not good enough and invites failure. He should endeavour to make a correct diagnosis; failure to do so may spell disaster. But this is not always easy. Those who wish to learn what a multiplicity of diseases can cause obscure pain can get enlightenment from an admirable article by Dr. Charles Hunter, of Winnipeg, which appeared in this *Journal* some nine years ago.[1] From this it is clear that to make a correct diagnosis in these cases requires a wide knowledge of medicine, surgery and gynæcology. It is quite impossible in the limited space available here to go into this matter of diagnosis fully; it must suffice to draw attention to some general principles and some possible sources of error.

First of all it should be determined whether the pain complained of is superficial, that is, located in easily accessible parts, such as the connective tissue, fasciæ, muscles, nerve trunks, tendons, joints and joint-capsules; or whether it is deeply seated in the head, chest, abdomen, or pelvis. Further, if it is superficial is it attributable to some lesion of an underlying organ? Here a knowledge of Head's areas of referred pain will be invaluable.

Localization of the superficial painful spots must be arrived at by careful palpation. These spots are commonly the result of "fibrositis", which causes a thickening of the tissues that can be felt, though not invariably, as bands, stringy thickenings, plaques, or nodules; rarely, the nodules can be seen. The lesions, too, are often multiple. Tenderness or pain can be elicited by pressure or strain. Pain is particularly liable to be associated with movement. In making the diagnosis an educated touch counts for much, but even if the lesion cannot be palpated fibrositis is not necessarily excluded.

Without care, superficial painful spots may be misinterpreted. Fibrositic headache, sometimes called occipital headache and rheumatic headache, is frequently attributed to eye-strain and the sufferers are referred to an ophthalmologist unnecessarily. Fibrositic neuralgia in the face may be mistaken for true trigeminal neuralgia. Pain in the chest due to fibrositis in the intercostal tissues has been interpreted as indicative of aneurysm, angina pectoris, or pleurisy, and, in women, cancer of the breast. Such errors are serious on account of the unnecessary alarm that they may cause and the faulty treatment that may be advised. Pain due to a lesion in the thoracic or abdominal wall has been attributed to acute or chronic appendicitis, peptic ulcer, cholecystitis, and pelvic disease, and the mistake has led to unnecessary operations. Lumbago is usually caused by a localized or diffuse fibrositis, but occasionally may be due to spondylitis deformans or Pott's disease of the spine. Accurate diagnosis here, again, is important. Sciatica is also usually due to fibrositis, but occasionally may result from the pressure on the sciatic nerve of tumours or inflammatory (tuberculous) exudates; more rarely, from congestion, such as may be caused by displaced pelvic organs (uterus, etc.).

1. HUNTER, C.: Fibrositis (myalgia, chronic muscular rheumatism), *Canad. M. Ass. J.*, 1926, **16**: 1319.

In the discussion so far we have used the term "fibrositis", which connotes the idea of "inflammation". A certain body of evidence exists which goes to shew that many cases of superficial pain of the character referred to are due to local areas of inflammation in which the exudation presses on sensory nerve filaments. Theoretically, this process may involve connective tissue (fibrositis), muscle (myositis), or a nerve (neuritis). It is hard to accept the view that any one of the tissues mentioned could be involved in an inflammatory process to the exclusion of the others, seeing that all three are in close juxtaposition. The correct term for the condition doubtless is "fibro-myo-neuritis". However, this is somewhat cumbersome, and the more commonly used name "fibrositis" is sufficiently accurate for practical purposes. Microscopic examination of the nodules has been made in a few cases. Doctor Stockman[2] describes the lesion in toxic fibrositis as a swelling between, and a proliferation of, the tissue fibres, together with changes in the finest bloodvessels and nerve-endings. The vessel walls are thickened, and therefore the affected area is liable to congestion, with, as a result, increased irritation of the inflamed nerve-endings. In the case of epidemic influenza, in which disease muscle pains are often a marked feature, Oskar Klotz[3] found, *post mortem*, patches of degeneration in the muscles, with rupture of their fibres and hæmorrhage, followed by the appearance of lymphocytes and plasma cells and proliferation of fibroblasts, ending in cicatrization—a true inflammation. Others, however, have been unable to find any lesion, microscopically, even when nodules were present, which was not always the case; hence the tendency to discard the idea of inflammation in favour of the view that "fibrositis" (myalgia) is either neuralgia (Schmidt,[4] Carnett,[5] or a disturbance of the colloid constituents of muscular tissue (Alexander, Krause and Brugsch[6]; Lange[7]).

Dr. W. H. M. Telling, of Leeds, in a recent paper[8] divides cases of fibrositis into three main classes:—those due (1) to septic and toxic influences; (2) to injury; and (3) to climate. The chief etiological factors in the first group are influenza, gonorrhœa, rheumatism, gout, erythema nodosum, and oral sepsis. Injury includes acute cases of contusion and laceration, and the much more common condition of strain, which last may be the result of a single act or of the repeated or persistent adoption of certain strainful attitudes. That the pain of "rheumatism" is affected by the weather is a commonplace of knowledge, although all affected persons do not react in the same way. The exact mechanism is obscure.

The treatment is relatively simple and will be efficacious if it be well directed and thoroughly carried out. A perfunctory handling of the case is doomed to failure. Even when diagnosis is correct and the treatment judicious it may be several weeks before a cure is effected. During the acute stage pain may be relieved by aceto-salicylic acid, but, if used, this drug should be given in full doses. Hunter advises the injection into the nodules of warm saline (10 per cent) or 0.5 per cent novocain in amounts of 5 to 10 c.c. Rest is indicated in certain types of case, as the post-influenzal and gonorrhœal, and, most rigidly, in rheumatic children, in order to minimize the risk to the heart. Rest is not indicated in fibrositic headache and the "pseudo-cardiac" case. Rest, too, may be overdone in the sciaticas and lumbagos. The cardinal feature in the treatment, after the acuteness has passed off, is massage, and it is here that the osteopath gets his innings. General massage is of little value, but local massage judiciously directed, to rub out or press out the exudation from fibrositic area, and so to improve the circulation, will often bring about remarkable relief. This line of treatment should be prescribed and supervised by the physician. Of course, any focus of infection should be removed, if possible. A. G. N.

2. STOCKMAN, R.: Rheumatism and Arthritis, Green, Edinburgh, 1920, p. 41.
3. KLOTZ, O.: Studies on epidemic influenza, Pub. from Univ. of Pittsburgh, 1919.
4. SCHMIDT: Der Muskelrheumatismus, Marcus and Weber, Bonn, 1918, p. 28.
5. CARNETT, J. B.: Chronic pseudo-appendicitis due to intercostal neuralgia, *Am. J. M. Sc.*, 1927, **174:** 579 and 833.
6. KRAUS, F. AND BRUGSCH, T.: Specielle Pathologie u. Therapie innerer Krankheiten, Urban., Berlin, 1924, **10:** 497.
7. LANGE, M.: Die Muskelhärten, Lehmann, Munich, 1931, p. 21.
8. TELLING, W. H. M.: The clinical importance of fibrositis in general practice, *Brit. M. J.*, 1935, **1:** 689.

Editorial Comments

Health Insurance in British Columbia

It is easy to see how steadily and relentlessly we are being drawn towards that stage of government control in medical practice which we may conveniently, if not quite accurately, designate "state medicine". One of the Provinces in which the most courageous and sensible attempt is being made to deal with this inevitable development is British Columbia. We have frequently referred to the activity of the profession in that Province in this respect. The stage has now been reached at which there is a completed Draft Act for Health Insurance before the local legislature, and its progress and possible modification will be watched with very keen interest.

At the moment, however, we think it worth while quoting some of the reflections the Act has evoked in the editorial columns of the *Bulletin of the Vancouver Medical Association.**

"It is too soon yet to comment on this bill. It will be carefully scrutinized by the Committee appointed by the Council of the College of Physicians and Surgeons, and it will be laid open for the examination and consideration of all concerned; but in the meantime, there are certain things that we feel should be kept in mind. First, there will be a natural tendency, especially with as individualistic a creature as the medical man, to feel that our own corns are the tenderest, and are in especial danger of injury. So one section of the profession may feel that some other is receiving undue consideration, and that its own members are suffering unduly. We do not think there is any danger of this. At first, it will be impossible to avoid some difficulties, and there may be some inequalities — but if we are all togther, and unselfishly considering the good of the whole, we shall have no trouble in meeting and solving the problems that may arise. And, secondly, we must keep an open mind, and not be too much influenced by the traditions under which medicine has been labouring (we use the word advisedly) for so long. Times are changing, says the Latin poet, and we change with them — and a reactionary attitude will help us not a whit, while it will delay, but only for a while, the inevitable social changes which are even now overdue. A flexible attitude need not be lacking in firmness — ask any competent physical-culturist—and rigidity invites fracture and irreparable damage, where flexibility would lead to a good result. It is not a case, we think, of resignedly accepting the change, while reserving the right to harbour secretly a feeling of resentment. The medical profession should lead in this matter, should recognize the need for radical change and the injustice and social menace of the present state of affairs; and should welcome reform, and throw its whole weight behind it. By so doing, we shall gain immeasurably. We shall convince society of our honesty and sincerity; we shall assume the position of leadership to which our qualifications as a profession entitle us; and we shall maintain and enhance our dignity and the respect in which we are held by the community. We believe that the profession will accept this position of responsibility and be true to its greater and more worthy traditions of service; a word much exploited and much abused, but still one of the greatest words in the language.

"And, lastly, we must remember that there is really only one consideration and it is the consideration that animates our profession at bottom: the truest welfare of the sick. We know better than anyone in what the real welfare of the sick man consists; we know what constitutes real medical care; and we should be ready not only to insist on good medical care but to detect any tendency to failure, and a compromise which, while apparently more economical and more immediately expedient, is yet unwise and ultimately injurious. Given sincerely and honestly, and without self-seeking, we cannot doubt that those who are sponsoring this Act will gladly and willingly listen to our advice and suggestions, since it is their earnest desire to frame an Act which will do the most good possible, and the least harm, to all concerned in its operation."

The caution with which all medical legislation should be undertaken cannot be overemphasized, and the difference of local conditions in our various (*and* varying) Provinces cannot be disregarded. But few will hesitate to admit that our Vancouver brother editor points out to us a common ground of agreement on which we may all gladly take our stand.

H.E.M.

* 1935, **11**: 165.

The Centenary of St. Mark's Hospital, London

St. Mark's Hospital was founded in 1835 by Frederick Salmon for the benefit of the poor afflicted with fistula and other diseases of the rectum. Salmon received his medical education at St. Bartholomew's Hospital and became M.R.C.S. in 1818. He became specially interested in diseases of the rectum, and in 1835, under considerable difficulties, acquired the premises at 11 Aldersgate Street, where he opened an institution known as "The Infirmary for the Relief of the Poor afflicted with Fistula and other Diseases of the Rectum." Only seven beds were available, but we note that 131 patients were admitted during the first year of operation. The Hospital removed to Charterhouse Square three years later, when its capacity was more than doubled. Here it remained thirteen years, until it again removed to the present site in City Road. The new building was completed and dedicated on St. Mark's Day, April 25, 1854. Gradually the need for further expansion became insistent, even as early as 1868, but it was not until 1896 that this need was met, at a cost of over £30,000. Now further expansion still is necessary, and the Management have taken advantage of a Centenary Celebration to press for the collection of £60,000. At the present St. Mark's has a waiting list of two hundred. It is sad to realize that some of the patients con-

cerned are afflicted with cancer and delay in dealing with them of course means death.

To celebrate the Centenary of the Hospital a banquet was given on April 25th at the Mansion House, presided over by the Lord Mayor, Sir Stephen Killik, who is president of the hospital. Sir Patrick Hastings, K.C., proposed the toast of St. Mark's. The Lord Mayor, in responding, remarked that since Salmon's original appeal St. Mark's had had the generous support of many famous men and women. Perhaps no Englishman ever championed more strongly the case of the sick and poor than Charles Dickens and his pen was used to great effect in criticizing charitable organizations which were not always what they should have been. The fact that Dickens was a subscriber to St. Mark's Hospital for twenty-five years was in itself no mean compliment to that institution. After Major Colin Cooper had made the centenary appeal a collection at the table resulted in the receipt of £3,443, which, with the amount already collected, made a total of £9,513 towards the objective.

The Medical Committee of the Hospital also signalized the occasion by issuing a handsome volume,* containing the history of St. Mark's, together with a list of the names of the Staff from 1835 to the present day, and reprints of some fifty-four papers on various aspects of proctology. The series begins, appropriately, with an article by Frederick Salmon, the founder, entitled "On the Causes, Symptoms, and Morbid Anatomy of Simple and Malignant Stricture of the Rectum", reprinted from *The Lancet* (1831-2, **2**: 238-43), and there are other classic papers by Allingham, Cooper, Goodsall and other leaders in the field of rectal surgery. Among more recent authorities we notice the names of Furnival, Lockhart-Mummery, Baldwin, Sir Charles Gordon-Watson, Dukes, Anderson, Norbury, Gabriel, Milligan, Morgan, and Lloyd-Davies. The range of subjects covered is wide, and so selected as to cover the whole subject of proctology. The book will well repay a study by those specializing in proctology and by the general surgeon as well. It is well illustrated and well produced, and is a credit to the Editorial Committee and St. Mark's.

We may properly conclude this brief reference with a quotation from the concluding sentences of the historical retrospect. "The hospital has been specially fortunate in the fidelity of its friends. The original address prepared for the supporters of the hospital in January, 1837, referred to 'this infant Charity now submitted to the fostering care of the British public'. Thanks to the fostering care of a long chain of helpers, giving often the best slice of their lives in this service, the infant charity has grown to be a vigorous centenarian — and is still 'going strong'."

A.G.N.

* Collected Papers of St. Mark's Hospital, London, including a History of the Hospital. Centenary Volume, 1835-1935. Compiled by the Medical Committee. XXVI and 440 pp. Illustrated. Cr. 4to. Price 30s. net. H. K. Lewis & Co., Ltd., London, 1935.

The Journal of Technical Methods and Bulletin of the International Association of Medical Museums

This journal, which used to appear at irregular intervals as the *Bulletin of the International Association of Medical Museums,* is for the future to be issued annually, and will, practically, constitute the Transactions of this Association. Its scope has been broadened, and it will contain editorials, articles and abstracts on museum administration and objective teaching methods, museum, autopsy and microscope technique, photographic and injection procedures, cardiac anomalies and teratology, historical retrospects in the above fields, and the proceedings of the annual meetings. While there are other journals that deal with technique, there is no other which is of the same or similar character to this; it is unique. Any one who studies it will admit that it decidedly has a place among medical publications. The international range of its sponsors ensures variety, interest, and practical utility. No one who is interested in pathology, whether as a teacher, morbid anatomist, or laboratory technician, should hesitate to join this Association and subscribe to its journal. Some idea of its scope can be gathered from the fact that there is an American and Canadian Section, with Prof. William Boyd, of Winnipeg, as president; a British Section, with Prof. Matthew J. Stewart, of Leeds, as president; and, we understand, an effort is being made to establish an Australian Section. Professor Ludwig Aschoff, of Freiburg, Germany, is the president of the International Association as a whole; Sir Arthur Keith, of London, is First Vice-president; and Dr. Maude E. Abbott, of Montreal, is Permanent Secretary.

The issue of the *Journal of Technical Methods* now before us, which is dated March, 1935, is extraordinarily full of meat. There are editorials on, among other subjects, The Use of Photography at the Post-mortem Table; The Second International Congress of Geographical Pathology, the Festschrift to Sir Robert Muir; The Arthur Keith Number of the *Journal of Anatomy*; and The Present Condition of the Early Anatomical Collections of Leyden University. Important original communications are, The Idea of a Clinical-Pathological Museum, by Prof. William Boyd, of Winnipeg; and The Method of Teaching Students Morbid Anatomy

at Autopsy, by Dr. M. McCutcheon, of Philadelphia. Those who have seen Professor Boyd's museum will readily admit that his "Idea" is a wonderfully good one. Professor Boyd remarks "That his attempt has been in a measure successful is indicated by the fact that whereas formerly students had to be driven to visit the museum, now they are to be found there in large numbers whenever they have a spare half-hour." There are two papers on photographic methods: The Colour Plate in Photomicrography, by Dr. Werner Muller, of Boston; and Infra-Red Photography, by Dr. Walter Clark, Rochester, N.Y.; also, five papers and an abstract on various cardio-vascular anomalies. There are numerous abstracts dealing with museum administration, museum and microscopic technique. There is a report of the Twenty-seventh Annual Meeting of the Canadian and American Section held in Toronto last March. Finally, should be mentioned obituary notices of William Henry Welch, Ulrik Quensel, Paul Edgar McNabb, William Walter Beattie, James Francis Coupal, and Ernest Scott. The frontispiece is a fine portrait of Professor Welch. The whole publication strikes us as being comprehensive and up to date. It reflects great credit on its editor, Dr. Maude E. Abbott. A.G.N.

An Atlas of Congenital Heart Disease

Those of our profession who are in the habit of attending medical conventions will doubtless remember an exhibit dealing with the Development and Embryology of the Heart and the Clinical Classification of Congenital Cardiac Disease, arranged by Dr. Maude E. Abbott, of McGill University. This exhibit, which has several times been shown in Canada and the United States, has always attracted much attention and favourable comment on account of its completeness, the logical arrangement of the material, and the correlation of the developmental and pathological data with clinical features, which render it of much practical value. It was with pleasure, therefore, that we saw it set up again in Atlantic City at the recent joint Annual Meeting of the Canadian and American Medical Associations. The American Heart Association, which met there at the same time, was specially interested in the matter, and the suggestion was made that the material be embodied in the form of an Atlas or photographic representation in book form, designed to present by pictorial art and in detail the various features of the conditions exhibited, both clinical and pathological, grouped on the basis of the physiology of the altered circulation produced by the various cardio-vascular anomalies. The Atlas would consist of a series of plates, 11 by 14 inches in size, reproducing the successive panels of the exhibit, and interleaved with text describing the subjects figured. If a sufficient number of subscribers can be obtained Doctor Abbott plans to publish a limited number of copies next Fall at a price not exceeding $5.00 per volume. This would seem to be a very desirable venture and the project is commended to our readers. Those wishing to subscribe on the above terms would facilitate the scheme if they would kindly send in their names at once to Dr. Maude E. Abbott, New Medical Building, McGill University, Montreal, or to the Secretary of the American Heart Association, 50 West 50th Street, New York City. A.G.N.

The Hickman Medal

We learn with great pleasure that the Hickman medal has been bestowed on Dr. Wesley Bourne, of Montreal, by the Royal Society of Medicine. This medal was founded in 1931 and its award is made for original work of outstanding merit in anæsthesia or subjects directly connected therewith. This is the first time it has been awarded. The choice was made by a unanimous vote of the Council of the Section of Anæsthesia and we know that Dr. Bourne's many friends will join us in congratulating him on the honour.

Hickman was a remarkable figure in the beginning of the last century. He was a pioneer in the use of nitrous oxide as an anæsthetic but his work was met with derision in England when he made his first communication in 1822. He had one sympathizer, a layman, Mr. Knight, who gave him encouragement, but the medical press of the time would give him no publicity. Later he reported his work before the Academy of Medicine in Paris and again was derided, except by the famous Baron Larrey who went so far as to offer himself for experimentation with it. These continued repulses went far to break Hickman's spirit and he died at the early age of 29 in 1829. It was 1846 before his experiments were recalled and his friend, Dr. Thomas Dudley, then wrote to *The Lancet* drawing attention to Hickman's discovery. This clearly established that he was the first to suggest inhalation as a method of producing anæsthesia for surgical operations. H.E.M.

Special Articles

CANADIAN INDIAN MEDICAL SERVICES*

BY E. L. STONE, C.M.G., M.B.,

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It is not the purpose of this article to commend or apologize for the medical or health services provided for the Indians of Canada, or to advance any argument for or against any proposal for provincial or other state-controlled systems of medical service. So far as I am aware, however, the medical service carried on for the benefit of the Indians is the only fully developed system of public medicine in operation in Canada, and the following outline of it may be of interest to those who are studying this problem.

The Indian wards of the Federal Government number some 112,500 souls, and live in about 800 separate communities. Roughly speaking, 25,000 live in Ontario, 25,000 in British Columbia, a similar number in the settled parts of the Prairie Provinces, 17,000 in Quebec and the Maritime Provinces, and the remainder in the remote parts of the north. Their communities vary in size, from the great Six Nations Superintendency in Ontario, numbering 5,000, to small reserves in British Columbia containing only one or two families. There are only seven reserves of more than 1,000 people. If there is such a thing as an average reserve, it may be said to contain perhaps 300 people.

Generally speaking, all these Indians are of a rural habit of life. There is, however, a large village reserve within eight miles of Montreal, whose inhabitants are industrial workers, mostly in steel construction, when work in that trade is available. There are also a few moderate-sized groups whose reserves adjoin cities or towns in various places, especially in British Columbia. For the most part, therefore, the Indians in settled parts are, like their white neighbours, more or less successful farmers. In the north they are still hunters of game and fish and trappers of fur-bearing animals. It is perhaps unnecessary to pursue the subject of occupation further except to observe that all the trades and callings of these people are fairly representative.

All these people are, by law, a responsibility of the Dominion Government, which carries out its functions by means of the Department of Indian Affairs, presided over by a Cabinet Minister known as the Superintendent-General of Indian Affairs. The unit of administration of the Department of Indian Affairs is the Indian Agency, comprising one large reserve or a group of smaller ones. These Agencies are not of any uniform size. Some are so small as to require only the part-time supervision of a local farmer or business man; others are of great extent. The largest is that of the Six Nations in Ontario, the management of which requires a considerable office staff, and the Agent of which is dignified by the title of Superintendent.

The Indian Agent, whether he has one reserve or many, is responsible for every matter affecting the interests of the Indians under his charge, including the development of agriculture or other local industry, the maintenance of law and order, the relief of poverty, and, most important for the purpose of this discussion, the administration of the medical and health services. Depending on circumstances, he may have more or fewer assistants in the way of clerks, farming instructors, etc. He has almost invariably one or more schools, and a medical officer, if one is available or can be made available. In some cases, the Agent is a physician and combines both functions in himself. In Western Canada there are District Officers having supervision over all Agencies within their Provinces. In the East the Indian Agents are under the immediate direction of the Department at Ottawa.

This perhaps too lengthy introduction seems necessary to afford a picture of the conditions under which the medical service is carried on. Those who have had military experience will recognize the system as very similar to that employed in the Army. The Indian Agent corresponds to the Unit Commanding Officer; the District Officer to the General Commanding in the Field, and the Department at Ottawa to the War Office. The Medical Officer occupies a similar position in both organizations. His position is very strong in his professional capacity, but he is subject to the supervision of a superior officer in administrative matters.

While, curiously enough, neither law nor Indian Treaty imposes any obligation on the Government to furnish medical services for Indians, except as the cost may be met from Indian Community Trust Funds, which many Bands do not possess, Parliament, by annual appropriation, provides funds by means of which practically a free service is carried on.

* Published by permission of Harold W. McGill, M.C., M.D., Deputy Superintendent-General, Department of Indian Affairs.

This service is necessarily limited by the amount of Parliamentary appropriation, and by the wisdom of the officers employed in charge of it.

Having regard to the difficulties inherent in providing any medical care whatever for many of the more remote Indians, it is perhaps fair to say that no Indian need lack the services of a physician or the advantages of a hospital when he is sick or injured, if by any means of transportation the doctor can be conveyed to him, or he be brought to the doctor or hospital. No community of Indians in settled regions is denied such medical or health facilities as the district provides. In remote parts hospitals have been constructed by the Government or by Church Missionary Societies, and medical officers are maintained by the Government. Should local facilities not be adequate, the sick Indian is conveyed to some centre where more skilled advice can be had. Sufficient funds have never been available to maintain all, or nearly all, tuberculous Indians in sanatoria, but, per 1,000 of population, there are substantially as many Indian sanatorium patients as there are white.

The service is carried on by some 11 medical officers, employed on full time; 8 others who combine the functions of Indian Agent and medical officer; and about 250 employed on part time for small groups, not including a number of surgeons and specialists in cities, to whom patients are sent from surrounding districts, and a quite indefinite number of physicians and dentists who have Indian patients more or less frequently without being employed in any regular manner. There is no dental service, as such. There is room for further development of this service, which is at present largely confined to the more primitive methods of treatment of adults, and a rather limited, though useful, plan of periodical clinics for school pupils. The field nursing service comprises 6 nurses assigned to large districts and 5 attached to local groups. Of these, 4 are graduates in public health nursing. In addition, the Indians enjoy the part- or full-time services of some 12 graduate nurses employed by Provincial and Missionary organizations or by the Victorian Order of Nurses.

The hospital service is based on using local existing hospitals so far as they are available. There are Indian patients more or less constantly in about 200 of these institutions, including mental hospitals and tuberculosis sanatoria. In several, the average number of Indian patients amounts to from 10 to 20 per day. Where local hospital facilities are not available or sufficient, or where the number and concentration of Indians are sufficient to render it advisable, Government hospitals are maintained. Of these there are 7 which may be classed as hospitals, the smallest being of about 8 beds and the largest of about 40. In addition, there are 3 nursing stations, primarily headquarters for a reserve nurse, but capable of accommodating one or two patients at need. Two public hospitals in Northern Ontario have sections for Indians alone, built at the expense of the Department, but carried on as part of the hospitals to which they are attached. There are also 15 hospitals maintained by missionary or community bodies, in which the Department has some financial investment, and which are operated largely, or at least substantially, for the benefit of the Indians. The Department does not assume authority over or responsibility for these institutions, but has more than an ordinary interest in them, in some cases manifested by periodical assistance if they are financially embarrassed, as they sometimes are.

Drugs are provided by a variety of methods. Many rural medical officers dispense their own as part of the service for which they receive salaries or fees. Others use the local drug store, the Department paying for their prescriptions on their endorsement. The greater proportion, however, use drugs and dressings supplied by the Department from central Government Medical Stores. This central store is the only feasible source of supply for reserves remote from centres where drug stores are available. There is, however, a growing tendency to use local sources to supplement these supplies, which are of standard variety and excellent quality.

Many Indian patients are unable to reach the doctor or hospital without financial assistance, which, in the aggregate, amounts to a good deal of money every year.

From the standpoint of control of communicable disease, the Department's aim is to accomplish universal vaccination against smallpox, to prevent typhoid fever, and to keep abreast of white communities adjoining reserves in immunization against diphtheria, which is uncommon among Indians. By and large, this aim is realized. Outbreaks occur, but there has not been a widespread epidemic of any of these diseases since 1928. Measles and whooping-cough spread or are controlled in about the same degree as among white people, and are rather more serious problems among Indians that among whites. For several years past the Department has endeavoured to carry on a sustained attack on syphilis. A great deal of work has been done and the results appear to be gratifying. In 1930 a survey was made to ascertain the prevalence of trachoma. The situation disclosed was such as to give rise to the greatest surprise and concern. In the next year a highly qualified eye specialist was engaged, and the situation already appears to be improving substantially.

Before discussing the cost of the service, it may be well to point out that some Indians do

not wish to avail themselves of its benefits. This has a bearing on the cost, though it is a factor which is rapidly disappearing. Indians, relatively speaking, do not suffer much from organic heart disease, cancer, diphtheria, or scarlet fever. They have more than their share of tuberculosis. Appendicitis is very rare among the primitive people of the North.

It may also be well to add something on the subject of administrative procedures. The medical officer is responsible to the Indian Agent, but he very seldom is required to consult the Agent before attending a sick Indian or sending him for his medicine. He is under obligation to consult the Agent before admitting his Indian patient to hospital, if, and only if, the condition of the patient will not be injured by the delay. He cannot send him to a sanatorium without the approval of the Department at Ottawa. His only regular return is a very brief monthly report, or, if employed on fees, a monthly account of services rendered. He, or the Agent, is required to consult the Department before engaging an aeroplane, but the Agent often engages the aeroplane for him, and reports afterward, without incurring any criticism if the circumstances are urgent. He is required to report communicable disease to the Agent, and the Agent to Ottawa by telegraph, and very frequently fails to do so. Having so reported, he is authorized, in conjunction with the Agent, to apply quarantine or other measures of control without any further formality whatever. The whole system is intended to relieve the medical officer and Indian Agent of correspondence and delay, and rather complete standing orders are issued to assist in accomplishing this purpose.

Fees for medical and surgical procedures are uniform throughout the service. On the whole they are less than those of the Workmen's Compensation Boards, but no report is required on the individual patient, the unit of attendance being the Indian community. It is usually possible for the doctor to visit several patients on one journey to the reserve. Fees for major surgical procedures are about equivalent to those paid by other medical service organizations.

Departmental nurses are well paid, and are provided with maintenance without deduction from their salaries. Dental fees are approximately equivalent to the charges of rural dentists. All fees and most salaries are paid monthly with reasonable promptness, and under ordinary circumstances without argument. If the patient is, without doubt, a ward of the Government, and the service has been rendered by the regular physician, or the doctor called in by a departmental officer, or, if not so called in, he can show that the attendance was essential, the Department pays the account without question. All accounts are subject to survey, and, if necessary, to taxation, by the Director of Medical Services at Ottawa, who has to satisfy the requirements of an exceedingly exacting Government auditor who demands detailed statements. It is possible that the doctor who is accustomed to presenting his patient in person with an account: "To Professional Services . . . $25.00", may find the requirements of Government irksome at first.

The general hospital rate is $2.50 per patient day, to cover all ordinary services, including the use of the x-ray and operating room, drugs and dressings. This might be considered a low rate for individual patients, but most hospitals find it fairly acceptable and appreciate the steady cash income from Indian sources. Special allowances are made for small remote hospitals and those having very few Indian patients. In only four cases has the Department arrangements with hospitals which provide for hospital care without compensation to the visiting staff. All are "closed" hospitals, two are clinical teaching institutions, and two are located in cities so large as to preclude, in any case, the employment of physicians designated to attend Indians. The Department never refuses to compensate the physician or surgeon if it is allowed to select him, and if the hospital will admit him to the public wards.

The Department reserves the right to designate the doctors who may attend Indians. Approximately half of those regularly employed are permanently engaged on annual salaries, and are civil servants. To open the field to all doctors would impose an administrative burden which would necessitate a greatly increased staff at Ottawa, and would be of doubtful advantage to anyone. This system, however, is not adhered to beyond a reasonable point. The Department does not contemplate that a sick Indian who is genuinely dissatisfied with the regular physician should be denied the services of another.

The cost of this service may perhaps be best shown by the following table. The figures are approximate, for the sake of convenience, but they are essentially accurate:

	Whole cost	*Per capita*
PROFESSIONAL SERVICES, including those of Nurses and Dentists ..	$388,000.00	$3.45
HOSPITAL CARE, including maintenance in sanatoria and mental hospitals; public hospitals and the operating costs of Departmental hospitals; including also 5 per cent interest on capital investment, and 5 per cent sinking fund on buildings belonging to the Department.....	576,500.00	5.10
DRUGS, and other related supplies	70,000.00	.64
TRAVELLING EXPENSES of patients and personnel, including purchase and operation of automobiles	40,000.00	.36
Other minor costs, such as freight, etc.	5,500.00	.05
	$1,080,000.00	$9.60

As stated at the beginning of this article, no contention is made that this service is adequate or otherwise, or that the cost is too great or too little. The service is facilitated by the organization of the Department, and by the assistance of about 110 Indian Agents who administer it in the field. If there were no field force of this kind it is estimated that about $30,000 per annum would be required to provide travelling officers to replace it. If the Department at Ottawa consisted of the Medical Service alone, some additional accounting staff would be required, which would cost perhaps $10,000 per annum. It is possible that these amounts should be added to the cost of the present service, which would increase it by about 35 cents per capita.

Medical Economics

MEDICAL RELIEF FOR THE UNEMPLOYED AND THEIR DEPENDENTS IN THE PROVINCE OF ONTARIO

By T. C. Routley, M.D., LL.D., F.R.C.P.(C.),

Toronto

On March 1, 1935, a plan of medical relief became effective in the Province of Ontario which is believed to be without precedent. By Order-in-Council the Provincial Government turned over to the Ontario Medical Association the administration of medical relief throughout the Province affecting close upon 400,000 people. By this Order-in-Council the Government indicated its willingness and desire to place wholly in the hands of the medical profession a task which the medical profession, we believe, is capable of undertaking. While the Association recognizes the responsibility which has been placed upon its shoulders it also recognizes that an unusual opportunity has been given to the medical profession to demonstrate its ability to handle its own affairs.

The following is the text of the Order-in-Council with comments:—

"For your information and guidance in dealing with medical services and medical supplies as these may be required by persons who are recipients of relief, this statement embodies the provisions of an Order-in-Council passed by the Provincial Government, following negotiation with and approval by the governing bodies of the Ontario Medical Association."

This paragraph requires little comment other than perhaps to say that, so far as our knowledge goes, it represents the first agreement of the kind ever entered into between a Provincial Government and a Medical Association.

1. There shall be provided by the Municipal Corporation of each City, Town, Village and Township, each and every month, a sum of money equal to the total of twenty-five cents (25c.) for each person registered for and in receipt of relief in such municipality at any time during such month, from which payment shall be made, as hereinafter set out, to Doctors, and Druggists, for Medical Services and Medical Supplies.

It is compulsory for every municipality in the province receiving money in aid from the Government for unemployment relief to provide 25c.* per month for each person registered for, and in receipt of, relief, such funds to be available to pay for medical services and medical supplies. Throughout the province the medical profession will recognize the significance of this provision in contrast to the previous arrangement, where it was optional for each municipality to determine whether or not it would be responsible for medical aid to persons on relief.

2. The Municipal Relief Officer shall, upon request, give a writing to any person registered for and in receipt of relief at the time that such writing is given, to the effect that such person is so registered, which writing when presented to any Medical Doctor shall be sufficient evidence to entitle such registered person or any member of his family to receive such medical attention, exclusive of hospitalization, as may be required.

The person on relief may consult the doctor of his or her choice; but such person must possess relief registration which the doctor must see and record with his account in order to be paid for services rendered.

3. Whenever in connection with his medical attention to a person registered for relief a doctor finds it necessary to prescribe any drug or medicine for such person he shall, where the services of a druggist are available, prescribe such drug or medicine through a druggist.

The attending physician may dispense or prescribe drugs as he chooses, but in both cases he is responsible for the cost of the drugs he orders for his patient. The exception to this rule will be found in the paragraph of the Order-in-Council entitled, "As to Household Remedies".

If the attending physician writes prescriptions, he may pay the druggist personally, or, if preferred, the drug accounts, as approved for payment by the Medical Relief Committee, will be paid directly to the druggist and the amount deducted from the doctor's account.

* Fifty cents in the Territorial Districts.

4. The Ontario Medical Association shall select for each municipality, subject to the approval of the Minister, a Committee (to be known as the Medical Relief Committee) consisting of Medical Doctors, and at least one Druggist, to which Committee shall be submitted all accounts from Doctors, and Druggists, who have provided Medical Services and Medical Supplies to recipients of relief in such municipality. Such Committee shall pass on all such accounts, and shall submit its recommendations to the Ontario Medical Association, who shall fix the amount payable to each Doctor and Druggist from the Municipal Fund, as provided each month in accordance with Section (1) hereof. Where it is deemed advisable a Committee as provided for in this section may act for two or more adjacent municipalities. The Relief Officer of each municipality shall be *ex-officio* a member of the Medical Relief Committee which represents his municipality when accounts for Medical Services and Medical Supplies relating to such municipality are being dealt with and passed for payment.

Each affiliated Medical Society in the Province is being invited by the Ontario Medical Association to nominate Medical Relief Committees. On each Committee will be a druggist nominated by the Ontario Retails Druggists' Association. On each Committee will be a municipal Relief Officer; and, where a Committee functions for two or more municipalities, the respective Relief Officers will be members of the Committee, each serving on it only when matters pertaining to the municipality which he represents are being dealt with. To the local Medical Relief Committee, the attending physicians and druggists will submit their accounts monthly. The Committee, having approved the accounts, will submit a summary of them to the Ontario Medical Association. The Association will pay the accounts on a pro rata basis, in the same ratio as the total of the accounts bears to the total sum of money available for the purpose in the municipality. Each municipality is considered separately in respect to funds.

5. Each municipality shall include in its monthly statement of relief expenditures rendered to the Unemployment Relief Branch, Department of Public Welfare, an item for Medical Services and Medical Supplies, reckoned on the basis of twenty-five cents (25c.) per person registered for and in receipt of relief, as set out in Section (1) hereof, and on receipt of such statement a refund will be made from the Provincial Treasurer of the proper percentage to the Treasurer of such municipality. The certified statement of the Municipal Relief Officer as to the number of persons registered for and in receipt of relief shall be the basis on which the amount of the monthly payment shall be determined.

This paragraph requires no comment other than to say that it deals with the manner in which the municipality is reimbursed from the Provincial Treasury for medical relief.

6. The Provincial Treasurer may withhold from a municipality and pay to the Ontario Medical Association on behalf of such municipality each month the amount due from the said municipality as determined in accordance with Sections (1) and (5) hereof.

This is a significant and important paragraph. It means that the money for medical relief will be paid by the Provincial Government to the Ontario Medical Association. The Association in turn will disburse the money to the doctors and druggists.

As to household remedies.—The provision of household remedies as may be considered necessary remains as heretofore in the hands of the relief administrator. The Unemployment Relief Branch will share in the costs of household remedies on the same basis as the costs of other relief commodities, provided that accounts for same are rendered under the heading of "Household Remedies" and include such articles only as are set out in the following list:— absorbent cotton, adhesive plaster, baby talcum, boracic acid, boracic ointment, castor oil, cathartic pills, cod liver oil, epsom salts, gauze (plain), lime water, liniment (white), milk of magnesia, petroleum jelly, tincture of iodine.

Accounts for Household Remedies should be submitted in the same statement with accounts for food, fuel, etc., and will be subject to the same audit and inspection by the province as are other expenditures.

As stated herein, relief recipients may secure upon application to the Municipal Relief Officer any of fifteen household remedies, none of which are chargeable to the medical aid account. The medical profession will recognize in this provision a saving of the funds which are available for medical relief.

The index figure for payment, namely 25c. per person on relief per month, is inadequate. Certainly, in sparsely settled areas, where travelling distances are great, there can be no question about the allowance being decidedly inadequate. But, had the Association not accepted this figure it was the expressed intention of the Government to turn the administration of medical relief back to the individual municipalities. After considering this possibility, the Council of the Ontario Medical Association decided that, even though the remuneration was much out of line with normal fees, the scheme should be given a fair trial as an experiment.

Success or failure in operating the plan will depend to a large degree upon the attitude which the profession takes in respect to it. If every physician interested approaches the matter sympathetically, realizing the opportunity which has been given to us to "prove a situation", we will find ourselves, a few months hence, in possession of information, statistics, and experience which will prove valuable in the days to come.

In every discussion in which the profession engages, relating to medical economics, the great need for actuarial data relating to the incidence of disease, medical costs, etc., con-

stantly comes to the fore. In this medical relief plan we have an opportunity which will not be lost sight of to secure data with regard to medical costs in Ontario, such as has never been known before.

As has already been indicated, the scheme is an experiment and no long-term contract has been signed. It is our firm conviction that the Government will view sympathetically such report as we will be enabled to make to it, particularly if it is found that the remuneration available to the profession is much too low.

Medical Relief Committees* are rapidly being set up throughout the province. The response in this connection from the affiliated medical societies throughout Ontario has been most encouraging. The Committees will have not only the responsibility of assessing and passing accounts, but, by virtue of the task placed upon them, they will all be study committees in the realm of medical economics. Viewing the situation broadly, the medical profession of Ontario may congratulate itself upon the opportunity which has been given to it. It is earnestly hoped that every physician in the province will find in conducting the experiment sufficient advantages to more than compensate for the personal financial sacrifice which he or she may make in carrying on the work.

THE ALBERTA HEALTH INSURANCE ACT, 1935

We have received a copy of The Alberta Health Insurance Bill which has passed its third reading. From this, we understand that one demonstration medical district will be set up so that the experience gained in this district may serve to guide the development of the new scheme for preventive and curative medical services in other districts.

For the information of the readers of the *Journal,* a summary of the Act has been prepared.

"This Act may be cited as 'The Alberta Health Insurance Act'.

"Medical services means professional services such as are ordinarily afforded by medical practitioners registered as members of The College of Physicians and Surgeons under The Medical Profession Act;

"Referred services means such special medical or dental services as are afforded by duly qualified medical practitioners or dentists, as the case may be, who are, for the time being, duly authorized to engage in the practice of any branch of medicine or surgery or dentistry as specialists;

"The Lieutenant-Governor in Council may appoint a commission to be known as The Health Insurance Commission, which shall be a body corporate and shall consist of three persons of whom one shall be a medical practitioner . . . .

"It shall be the duty of the Commission and it is hereby empowered—

. . . .

(*b*) to appoint such officers as it may deem necessary, ... to prescribe their duties and fix their remuneration,

(*c*) To make such regulations and prescribe such forms as may be deemed expedient for carrying out the provisions of this Act . . . .

. . . .

(*g*) . . . . to divide the Province into proposed medical districts for the purposes of this Act."

The Act provides machinery for a popular vote to determine the majority view before creating a medical district. If the majority is in favour, the Commission may organize such a district with a local Advisory Board composed of one representative from each municipality included in the medical district.

"The Commission may, from time to time, appoint professional boards of reference for the purpose of enquiring into, considering and reporting on any question arising out of or relating to any dental service, hospital service, medical service or nursing service.

"Every professional board of reference shall consist of a chairman and two other members . . . . the chairman shall be appointed by the Commission and one member shall be nominated by the local advisory board of the medical district in which the question arises and the third shall be nominated by the governing body of the profession affected by or concerned in the question;

"The member of the advisory board for each municipality in a medical district and the chairman and secretary of the advisory board shall be a local board of reference for that municipality and shall hear and determine all questions and disputes not being questions or disputes of a professional nature . . . .".

When a medical district is formed, the municipalities included are responsible to pay to the commission a sum equal to $11.28 per caput of population per annum; from the General Revenue Fund of the Province a sum equal to $3.22 per caput of population per annum shall be paid to the Commission.

In the medical district, the money is to be collected as follows: $2.01 per month by persons on salary or wages; $0.81 per month by the employers of such persons; casual employees pay one cent per hour for every hour of casual employment; one-half cent per hour is paid by the employers of such casual employees; every income-earner other than those mentioned shall pay $2.82 per month. (This is based on the provision of public health services and medical care services at $14.50 per caput per annum, it being estimated that three persons are dependent on each income.)

". . . . every resident of a medical district, so long as he continues to be a resident thereof, shall be entitled to receive, without charge to him, the following benefits:

(*a*) any necessary hospitalization in a public ward;

(*b*) any necessary nursing services;

(*c*) any necessary medical and surgical attention, advice and treatment;

* Ninety-two Medical Relief Committees have been appointed, covering the entire Province.

(*d*) any necessary dental attention, advice and treatment;

(*e*) the benefit of such laboratory services such as x-ray and biochemical services and such hospital facilities as may be requisite for the purpose of diagnosis;

(*f*) all such drugs, medical and surgical supplies and appliances as may be prescribed by the medical practitioner under whose care he is for the time being,"

". . . . the medical practitioner or dentist so consulted shall be paid by the Commission for his services in the manner according to the tariff and subject to the conditions prescribed by this Act or any conditions prescribed by any regulations made pursuant thereto.

"Any resident of a medical district . . . . may consult any medical practitioner . . . ."

It is provided that the Commission may arrange for the carrying-on of public health services.

The Commission has the power to discipline those who provide and those who receive service.

It is not so stated in the Act, but it is understood that the regulations will provide that accounts for services rendered be forwarded monthly, certified by the beneficiary. The accounts will be taxed and paid by the Commission on schedules to be arranged between the Commission and the governing bodies of the professional groups providing services.

GRANT FLEMING

THE WINNIPEG RELIEF PLAN

In view of the interest throughout the Dominion on the question of Federal or Provincial Health Insurance the subjoined record of the operations of the Winnipeg Relief Plan for a period of one year will probably prove to be of value.

When the Winnipeg plan was adopted, the only figures available led us to express the view that a relief medical service could be provided on a modified scale of fees for $1.75 per head per annum. The marked discrepancy between theory and fact suggests that the scale of fees submitted in the various Provincial Health Insurance plans may also be very wide of the mark, and the profession must be warned about entering on a course which in its present form will prove to be detrimental to their interests.

This report is submitted in the hope that every doctor who is interested will study and analyze it before endorsing or even accepting terms about which he knows little. It is believed that it is the only report of its kind available in the Dominion and possibly in the North American Continent. The figures for an additional 10,000 relief cases in the suburbs of Winnipeg do not materially alter the picture.

SUMMARY OF MEDICAL CHARGES FOR SERVICES TO PATIENTS ON RELIEF FROM MARCH 1, 1934, TO FEBRUARY 28, 1935
(TWELVE MONTHS)

			Percentage	*Average month over a 12 month period*	
Calls—					
House	15,987	$23,992.75		1,332	$1,999.40
Office	22,265	22,448.25		1,855	1,870.69
Hospital	8,065	5,185.70	50	672	432.14
Operations—					
Major	519	20,533.00		43	1,711.08
Minor	900	7,580.73		75	631.73
T. and A.	727	10,852.50		61	904.38
Fractures	33	671.66	37	3	55.97
Maternity—					
Hospital	702	6,994.75		59	582.90
House	137	2,600.00	9	11	216.67
Sundries—					
Special Exams.	243	1,198.50		20	99.88
X-rays	193	1,677.33		16	139.77
Anæsthetics	234	825.58		20	68.80
Dental	1	1.25		—	.10
Consultations	266	792.00	4	22	66.00
Gross total		$104,647.00			$8,720.58
Net total		93,890.89			7,824.24
Number doctors rendered accounts		2,590			216
Net average cost per doctor					$36.25
Cases reported hospitalized		2,029			169
Average number of people on relief per month					34,040
Average gross cost per person for 12 months					$3.07
Average net cost per person for 12 months					$2.76

After reading the above figures there are many points to be considered. The percentages show what a large proportion of treatment is provided by the general practitioner, which is interesting in view of the fact that the patient is entitled to choose his doctor.

The scale of fees is as follows:

All major surgery, which includes a reasonable amount of post-operative care, $25.00. Tonsillectomy, $15.00. Confinements in hospital, $10.00 — in home, $20.00 — both to include ante- and post-natal care in a normal case. House calls, $1.50. Office calls, $1.00. Eye, ear, nose and throat specialists get a somewhat higher fee for office consultations, but a certain list of minor operations and treatments may have to be performed at this consultation. Hospital visits are fifty cents (50c.), but only one visit every second day is paid for, unless the patient is shown to be suffering from an acute and serious ailment. Consultations are $3.00, and x-ray work is done on an agreed-on schedule.

It is not claimed that these fees are remunerative. There are several factors which reduce the cost to the city. Two whole time and two part time doctors, employees of the city, treat relief cases; the salaries of these medical officers are not included in the summary. The difference between the gross and net totals is due to the fact that with few exceptions no doctor is paid more than $100.00 in one month, though his earnings may be considerably above this figure. The city undertakes all administration.

Before the gross total is reached, all bills submitted are taxed. Visits to note progress, or for minor treatments, either of which could

have been done by a visiting nurse, are refused. If the number of visits appears to be excessive, the medical referee, a city official, reduces them, and the practitioner may submit his case for redress to a Medical Board.

All emergencies can be treated without written authority from the Medical Referee. Chronic cases requiring surgical or prolonged, and sometimes expensive, medical treatment are frequently referred to the Medical Advisory Board for an opinion as to necessity for treatment or likelihood of benefit. For reasons of economy tonsillectomies in adults and refractions are rarely authorized.

It will be seen that all these restrictions are intended to reduce the cost of supplying medical service to the unemployed on relief. The service is complete in-so-far as relief of pain, protection of life and prevention of disability or death, are concerned; but the reader must ask himself, Would people under a Health Insurance scheme be satisfied with such a modified service?

An efficient but restricted service should have cost the City of Winnipeg $3.07 per head per annum. If the patient under a Health Insurance plan accepted all the treatments recommended by his doctor, and insisted on the employment of the modern aids to diagnosis and treatments, it seems certain that the cost would be very much higher than the estimates frequently put forward, that is, if the doctor is to receive a reasonable remuneration.

E. S. MOORHEAD

Men and Books

THE EARLY DOCTORS OF MANITOBA

By Ross Mitchell, M.D.,

Winnipeg

(Continued)

H. S. Beddome, a Guy's Man

H. S. Beddome was born in London in 1832, and took his medical course at Guy's Hospital, London. In 1851, after completing two years of his course he went out to York Factory as ship's surgeon on the Company's ship which yearly took supplies. After graduating in 1852 he set out for Rupert's Land, and practised at the Red River until 1859, when he married Frances Omand, and went to York Factory as Hudson's Bay surgeon. He returned to the Red River in 1865 and practised in St. Andrew's up till the time of his death, March 20, 1881. He died at Headingly at the residence of his son-in-law, the late John Taylor, Jr., and was buried in St. Andrew's churchyard. During the outbreak of small-pox among the Icelanders at Gimli in 1876, which lasted six months, he treated the sufferers, enduring many hardships and privations. His practice in St. Andrew's yielded little remuneration, but his life was spent in trying to relieve the sick. His yellowed diplomas from Guy's Hospital, bearing date May 26, 1852, have on them such famous signatures as those of Thomas Addison of Addison's disease fame, John Hilton, who wrote the surgical classic "Rest and Pain", and Alfred Taylor, whose work on medical jurisprudence is still an authority in courts of law. No better evidence of the general lack of knowledge concerning Rupert's Land in 1852 can be given than the fact that on his certificate of membership from the Royal College of Surgeons of London the name and address of the member are given as "Henry Septimus Beddome, Hudson's Bay, North America".

C. J. Bird, Physician and Politician

Curtis James Bird, son of Chief Factor James Bird, a Governor of Assiniboia, was born in

C. J. Bird

1838 at Marchmont House, Middlechurch, Red River Settlement, educated at St. John's College, and took his medical course in Guy's Hospital, London. He returned to the Red River, practising first at Middlechurch, where he lived on the Bird estate, but later moving to the new city of Winnipeg. He succeeded Dr.

Bunn as coroner in 1861, was a member of the Council of Assiniboia in 1868, and a member of the Provisional Convention which met in 1869. He was one of those appointed in 1869 to frame the new Bill of Rights, the other members being James Ross, Thomas Bunn (son of Dr. Bunn), Louis Riel, Louis Schmidt and Charles Nolin. When Manitoba became a Province he was elected member for St. Paul's Parish in the Legislative Assembly, and was made Speaker. A ruling which he gave regarding a bill to incorporate the City of Winnipeg bringing him into bad odour, he was lured out, ostensibly to see a patient on the highway leading north one night, and was waylaid and tarred and feathered by a gang of disguised men. While on a trip to England in May, 1876, he contracted pneumonia and died. He was the "Beau Brummel" of the profession, a good diagnostician, and a man of culture and refinement.

JOHN CHRISTIAN SCHULTZ

In the 60's medical men from eastern Canada began to turn their eyes to the Red River colony. Foremost among these was John Christian Schultz, a native of Amherstburg, Ontario, whose life was a real romance, culminating in his being appointed Lieutenant-

John Christian Schultz

Governor of Manitoba (1888 to 1896) and receiving knighthood from Queen Victoria. Born on January 1, 1840, he inherited from Viking ancestors the fair hair, blue eyes, and immense frame which enabled him to stand tremendous privations in the stirring days of the North West. While a medical student at Queen's University he visited "The Forks" in 1860, and became greatly interested in the possibilities of the great new country. After completing his studies he returned the following year, and when the Institute of Rupert's Land was formed, a scientific and historical organization of which Wm. McTavish, Governor of Assiniboia, was president, he became secretary. He was the first doctor in that community to venture to any extent on surgery under the primitive sanitary conditions prevailing. In addition to his medical practice he had a drug store at what is now the corner of Main and Water Streets and engaged in the fur trade which led to clashes with the Hudson's Bay Company. As an example of his hardihood may be mentioned the perilous trip made by himself and an American companion from St. Paul to Fort Garry in the fall of 1861. Travelling only by night and without camp fires they succeeded in restoring communications which had been interrupted for months on account of the "Spirit Lake massacre" of American settlers by the Sioux.

The Rev. Mr. Garrioch, in "First Furrows" tells this story of Dr. Schultz. "In 1867 the writer was at St. Cloud and present at the railway station when the doctor's carts were being loaded with goods for the return to the Settlement. As each ox-cart received its load, averaging about nine hundred pounds, it was hauled aside from the platform to make room for the next. A stalwart half-breed had made a determined but vain effort to move one of these loaded carts aside, when the doctor came up and taking his place between the shafts, rapidly and gracefully moved it the required distance, and as he returned said to his man, 'You see, Tom, I am the better ox'." In 1864 he was Worshipful Master of Northern Light Lodge, the first lodge of Masons in British North America west of the Great Lakes. Dr. Bird was Steward. He purchased the *Nor'Wester,* the first paper published in the Red River Settlement, and wrote many fiery articles against the monopoly of the Hudson's Bay Company. Later, he disposed of the *Nor'Wester* to his associate, Dr. Bown, a dentist. When Riel formed his Provisional Government Schultz hoisted the red ensign with the word "Canada" across the whole face on the flagpole in front of the *Nor'Wester* office. Goods belonging to the Canadian Government were stored in his warehouse, and when it appeared likely that Riel would seize them, Schultz and his friends determined to defend the warehouse. Riel's men brought a cannon from Fort Garry on December 7, 1869, and, Schultz' party being outnumbered, they surrendered and 45 men were taken as prisoners to Fort Garry. At first they were kept together, but later Schultz was placed in solitary confinement. His wife smuggled in to him a knife and a gimlet and on the cold stormy evening of January 23, 1870, the doctor made his escape by cutting his buffalo robe into strips forming a rope which was secured to the frame

of the window by the gimlet. The rope was insufficient for his great weight and he fell to the ground injuring his leg. However, he succeeded in scaling the outer palisade, and made his way to Kildonan, where he was sheltered by Mr. Robert MacBeth. Riel put a high price on his head, but in March Schultz and the half-breed guide, Joseph Monkman, succeeded in eluding Riel's guards and made their way by snow-shoe and dog-train overland to Duluth and thence to eastern Canada. He and the poet, Charles Mair, his nephew by marriage, addressed many meetings in Ontario after the shooting of Scott, and their eloquence was largely responsible for the formation of the Ontario Rifles which accompanied Col. Wolseley's regulars. After Manitoba entered Confederation Schultz was elected M.P. for Lisgar, and later was appointed to the Senate. On July 5, 1888, he was sworn in as Lieutenant-Governor of Manitoba. In 1896 he died in Mexico whither he had gone in search of health, and was laid to rest in St. John's cemetery, Winnipeg.

JAMES S. LYNCH

Dr. James S. Lynch came to the Red River in 1868 with the Snow party, whose purpose was to build a road from the north-west angle of the Lake of the Woods to Winnipeg. In the troublous days of 1869 Col. Dennis authorized Dr. Lynch to raise a company of English Canadians in Winnipeg. Dr. Lynch was one of four doctors imprisoned by Riel in Fort Garry. He was present at a meeting called by Lieutenant-Governor Archibald in 1871 to discuss the formation of a hospital in Winnipeg, and he, together with Doctors O'Donnell and Jackes, formed the first staff of the Winnipeg General Hospital. He was in charge of measures directed against the small-pox epidemic at Gimli in 1876, and was a member of the Sanitary Board of the District of Keewatin formed to deal with infectious diseases among the Indians. He practised for a time at Portage la Prairie and contested the Marquette seat in 1871 with Angus McKay. The vote was a tie and both candidates proceeded to Ottawa to claim the seat, but, before the committee appointed to investigate the matter reported, the house dissolved and Dr. Lynch did not seek re-election. In 1877 he became the first President of the College of Physicians and Surgeons of Manitoba, and after his death the Council of the College awarded a silver medal, the Lynch Clinical Medal, for the best clinical report of cases treated in the Winnipeg General Hospital. He died in 1894. Archbishop Matheson, in a personal communication, told the following story of his passing: "I visited him at the Winnipeg General Hospital during his last illness and he died in my arms. Courageous and bright to the last, when his wife came in as he was just passing away, and said 'Do you know me, James?' 'Why of course', was his reply, 'I was present at your wedding, if you can look back that far'." Dr. H. H. Chown speaks of him as "a true gentleman in appearance, in manner and in spirit".

JOHN HARRISON O'DONNELL

John Harrison O'Donnell was born in Simcoe County, Ontario, graduated in medicine in Victoria University in 1861, and in 1869 set out for the Red River settlement. In St. Paul he met Mr. Jas. J. Hill, who warned him that the Métis at Fort Garry were threatening mischief to the Hon. William McDougall. Mr. Hill, however, introduced the doctor to one of the Red River pioneers, William Gomez Fonseca, and on his advice the doctor sacrificed his black Dundreary whiskers and enrobed himself in native-made jacket, cap, belt and moccasins. Mr. McDougall's party joined theirs, but, although the vice-regal party was stopped near the present St. Norbert, Fonseca and O'Donnell were allowed to proceed. Dr. O'Donnell was taken prisoner on the surrender of Dr. Schultz' warehouse; later he was released from Fort Garry. As Justice of the Peace he swore out a warrant for the arrest of Riel and Lepine after the coming of Col. Wolseley's party.

On the creation of the Legislative Council on March 15, 1871, Dr. O'Donnell became Speaker of that body, and remained a member until Manitoba's Upper House was dissolved in January, 1876. He took an active part in the formation of the Winnipeg General Hospital, and was president of the attending staff until 1882, and senior consulting physician from that date up to the time of his death. He was president of the Medical Board which later became the College of Physicians and Surgeons, first president of the Manitoba Board of Health, and a member of the first University Council. In 1897, when the British Medical Association met at Montreal he bore with him to that meeting a letter from the Hon. Thomas Greenway, Premier of Manitoba, inviting the association to meet in Winnipeg, an invitation which was accepted thirty-three years later. He died in Winnipeg in 1912.

A. G. JACKES

Dr. A. G. Jackes was one of the suite of the Hon. Wm. McDougall but, unlike the other members, he was allowed to proceed to Red River. For a time he practised at Portage la Prairie, but moved to Winnipeg in 1873 and commenced a practice which soon developed into one of the largest in the city. He was a witness to the signatures to the Lake Winnipeg Treaty in 1875, and was secretary to the Indian Treaty Commission in 1876 when treaties were made at Forts Carlton and Pitt.

ALFRED CODD

Dr. Alfred Codd, as Medical Officer, accompanied the Ontario Rifles in the Wolseley Expedition of 1870 and settled in Winnipeg. For many years he was surgeon at Fort Osborne Barracks, in addition to carrying on a large private practice.

EDWARD BENSON

Dr. E. Benson came to Manitoba in 1874. He was coroner for Winnipeg and chairman of the School Board, and by his geniality, kindness, and sense of humour endeared himself to a large circle.

DR. BRETT AND THE EARLY WINNIPEG DOCTORS

In 1882 Winnipeg had grown very rapidly, and the number of doctors had correspondingly increased. Of this group of physicians Dr. F. H. Mewburn, on the occasion of the presentation to the University of Alberta in September, 1926, of an oil painting of the Hon. R. G. Brett, M.D., Lieutenant-Governor of Alberta, spoke as follows: "It was in 1882 I first met Dr. Brett. He was one of a remarkable group of medical men for as new a city as Winnipeg to have; a group headed by Lynch and including Blanchard, Kerr, Good, Jones, A. H. Ferguson, R. B. Fergusson, McDiarmid, Gray, Whiteford and others; Chown and Higginson came later."

DAVID YOUNG, PIONEER PSYCHIATRIST

The infant province found many problems on its hands, among them being the care of the insane. These were first cared for in the provincial penitentiary, situated first at Lower Fort Garry and afterward at Stony Mountain, but in 1884 the Provincial Government, recognizing the need for separate care of mental patients, appointed Dr. David Young as medical superintendent of the projected mental hospital at Selkirk. In 1886 the first buildings were completed, and Dr. Young remained at the head of the institution till 1912, when he retired to private life.

Dr. Young was born in 1847, and graduated in medicine from Queen's University, Kingston, in 1871. In June of that year he came to Manitoba and engaged in practice near Lower Fort Garry. He was married in the following year, and he and his wife for many years dispensed hospitality in their charming home on the bank of the Red River. The grasshopper plague of 1875 caused such scarcity of fresh vegetables that an epidemic of scurvy broke out, and Dr. Young laboured day and night to aid those suffering with that disease. As a psychiatrist he brought qualities of skill, insight, and kindliness into his treatment of the mentally afflicted. He died in Winnipeg, October 16, 1931, at the advanced age of eighty-four years, and was buried in Little Britain cemetery near his old home on the Red River.

DOCTORS IN POLITICS

In addition to Bird, William Cowan, Schultz, O'Donnell and Lynch, whose political activities have already been mentioned, many early doctors of Manitoba played their parts in provincial politics. In the Legislative Assembly of 1874, James Cowan first took his seat as member for High Bluff; and later was chosen by acclamation to represent Portage la Prairie, where he practised for many years. He died in 1910.

David Henry Wilson graduated as medallist of his class from Trinity Medical College, Toronto, in 1878, and started practice in Nelsonville, which as a county seat boasted a fine court house and seemed to have a bright future. When the Pembina Branch of the Canadian Pacific Railway was built, Morden was chosen as the townsite and Nelsonville was passed by. The inhabitants, among them Dr. Wilson, put their houses on skids and hauled them to the new location. In 1884 Dr. Wilson, who had been a member of the Legislative Assembly, became Provincial Secretary in the Norquay Government. He was one of the thirteen original incorporators of the Manitoba Medical College, secured the passage of the incorporating Act, and was Professor of Diseases of Women in the college until he removed to British Columbia in 1894.

David Howard Harrison has the honour of being the sole medical premier of the province. True he was premier for only twenty-three days, but he had the misfortune to head a party dispirited by the loss of its able chief, John Norquay, and ripe for defeat. Graduating from McGill in 1864, he practised medicine in St. Mary's, Ontario, until 1882, when he moved to Manitoba, settled at Newdale, and operated a large farm. In 1883 he was elected member for Minnedosa, and three years later he was sworn in as Minister of Agriculture, Statistics and Health in the Norquay Government. He became premier in December, 1887, but resigned in January, 1888, when a government candidate was defeated in a by-election. In the ensuing general election his party was beaten and he retired to private life. He died at Vancouver in 1906.

PIONEER WOMEN PHYSICIANS

A pioneer physician whose name is held in affectionate remembrance for her ministry to the sick and suffering settlers was Charlotte W. Ross. In 1875, though already married, she graduated from the Women's Medical College, Philadelphia, and was the first woman to practise medicine in Montreal. In 1878, her father, Joseph Whitehead, who, as a young man, had fired Stephenson's first locomotive "The

Rocket", and her husband, David Ross, went west to build Section 15 of the Canadian Pacific Railway. Three years later Dr. Ross with her children joined her husband at Whitemouth in eastern Manitoba.

Though Dr. Ross had the care of her children and her home she was obliged to make use of her professional knowledge and skill in caring for the medical needs of the settlers in her district. In order to visit her patients she made use of many means of transport: locomotive, handcar, caboose, sled and buckboard. For many years the Ross home at Whitemouth was a centre of religious, social and cultural influence. She died at Winnipeg in 1916, and the Charlotte W. Ross Gold Medal awarded annually in Obstetrics and Diseases of Children perpetuates her memory.

The first woman physician of Winnipeg was Dr. Amelia Yeomans, whose name first appears in the register of the College of Physicians and Surgeons of Manitoba in the year 1885. She was a strong temperance advocate and, for that day, an advanced feminist.

DOCTORS AS AUTHORS

Dr. J. S. O'Donnell, who has already been mentioned, wrote an account of his experiences under the title "Manitoba as I Saw It, 1869 to Date". The book, dedicated to Alexander Hugh Ferguson, Surgeon, Chicago, who had been one of the leading surgeons of Winnipeg, gives a clear account of the troublous times which attended the birth of the new province.

H. Aubrey Husband before moving from Edinburgh to Manitoba in 1885 had won distinction as a writer of medical text-books, remarkable for lucidity and conciseness: "The Student's Handbook of the Practice of Medicine" which went into several editions; "Sanitary Law"; "Nurse and Baby"; "The Student's Pocket Prescriber and Medical Jurisprudence". Particularly in the latter subject he was an authority, not only by virtue of his book but through his lectureship in the Extra-Academical School of Edinburgh on Medical Jurisprudence and Public Health. He was born on the family estate in Jamaica, and obtained his medical education in Edinburgh, where he received the degrees B.Sc., M.B., M.C., F.R.C.S.E.

With the completion of the Canadian Pacific Railway Manitoba became a Mecca for the adventurous and enterprising. With the great influx of settlers attracted by the fertility of the soil, the ease of cultivation, and the promise of free homesteads, the new province offered many attractions to the professional man, who saw in it not only possibilities for the present but future opportunities for his family. Dr. Husband began practice at Old Milford, and as his professional fame spread he became so busy that he required a partner whom he found in Dr. Brand, of Wawanesa. Dr. Husband moved to that town, so beautifully situated on the Souris, and practised there until 1900, when he retired to his farm. In 1904 he returned to Jamaica, to take possession of the estate which he had inherited, and continued there until his death in 1932 at the venerable age of eighty-eight years and nine months.

The advantages of this western country newly opened for settlement are set forth in "Thirteen Years on the Prairies" by John Pyne Pennefather, M.D., published at London in 1892. The reasons which induced him to come to this new land were, as he states, "an inherent love of change and four sons growing up". He arrived in Winnipeg on April 14, 1880, in the midst of a wild snowstorm, and, buying 640 acres of land from the Hudson's Bay Company, began farming. In the spring of 1885 the North-West Rebellion broke out on the Saskatchewan, and Dr. Pennefather, the son of a distinguished soldier, became chief medical officer in General Strange's column, and was under fire at Frenchman's Butte. His experiences in this campaign are described in the book. He was born at Poona, Bombay, in 1833, his father being in the service of the East India Company. He was educated for the army, but an accident to his foot led him to study medicine. Graduating from Trinity College, Dublin, as a surgeon in 1854, he went out to India in charge of a large force, but returned to obtain a degree in 1859 from the Royal College of Physicians. He practised at Corsham in Wiltshire, then went to London where he practised as a Harley Street specialist, being surgeon to the Royal Dispensary for Diseases of Ear and Throat on St. James Street, Soho, where he was associated with Sir Morrell MacKenzie. He was the founder of the first free dispensary in London for the treatment of diseases of the ear. From 1878 to 1880 he lived the life of a country gentleman on his estates in Ireland. Then, appreciating the inducements which this great land holds out as a home for the redundant Anglo-Saxon race, he came to Manitoba.

After his experiences in the 1885 rebellion he practised in Winnipeg till 1903 when he opened a sanatorium at Holland, Manitoba, but returned to Winnipeg in 1906. He died on April 14, 1913, on the anniversary of his arrival in Winnipeg, in his eightieth year.

In addition to the book mentioned he wrote "Finale to Dame Europia's School", "The Past and Passing Events", and contributed regularly to the *Dublin University Magazine* in prose and poetry. Several of his short poems are of considerable merit.

With the coming of the railway to Manitoba and the consequent rapid development of the country we reach a period well within the memory of many now living, and here a halt

must be called. The list of doctors mentioned is not to be considered complete. The whole cast has not been given, but the principal actors have been summoned, and have made their bow before you. Perhaps a fleeting reference might be made to doctors who distinguished themselves as explorers and who for a time at least found shelter, and an outfitting point in Fort Garry: Sir John Richardson, the companion of, and searcher after, Sir John Franklin; Dr. John Rae, who led five Arctic explorations, discovered the fate of Franklin, and surveyed the line for the telegraph between Winnipeg and Victoria; Sir James Rector, second in command of the Palliser Expedition, whose monument is situated at the Great Divide; and Dr. W. B. Cheadle, who traversed this country in 1862-63 with young Lord Milton, and nearly lost his life crossing the Rockies by Jasper House.

Looking back on the records of these early medical men who saw a vast empire inhabited first by the Indian and the buffalo come under the domain of the white man, the fur trader give way to the farmer, and the birch bark canoe and the Red River cart vanish before the steamboat and the locomotive, we may say "There were giants in those days".

Hospital Service Department Notes

Coordinated Planning — The Need in Hospital Development

Our Canadian hospital system has been highly praised the world over, and rightly so, too, for features have been evolved which have admirably suited our needs and would well warrant adoption by other countries. At the same time there is still room for improvement in many aspects, and not the least of these is that of coordinated control of hospital development. At the present time (referring to general hospitalization and not that for mental disease or tuberculosis) the erection of hospitals is largely dependent upon local initiative. Even when hospitals are erected and administered by religious organizations or by the Red Cross Society the initial request usually arises locally. This local initiative, creating as it does an atmosphere of pride and of obligation, is highly desirable and should be encouraged, but, unfortunately, it frequently results in duplication of effort and unnecessary expense. Not only may we have a thickly populated rural area such as a fertile valley or along a railway line with a small hospital in practically every neighbouring community, but some towns may have two or more hospitals where one would be sufficient. Improved motoring has greatly reduced the actual *time*-distance separating communities, and the obvious advantage of having a hospital close by is often more than overcome by the fact that in an entire chain of neighbouring small hospitals there will probably not be one good pathological laboratory with a pathologist, not an expert radiologist nor a biochemist, no dietitian, no electrocardiograph, no organized transfusion service, no adequate physiotherapy department, nor many other diagnostic and therapeutic facilities which are provided in large hospitals. At the same time we have in Canada large areas, often the same areas, without adequate provision for the chronically ill patient, the incurable, the convalescent, or even the patient with a communicable disease.

While the town or community with a hospital and its repeated appeals and deficits feels that it is bearing most of the financial load which should be more fully shared by neighbouring communities profiting by the presence of the hospital, these other communities often feel that their costs for indigent hospitalization would be less were they to have their own hospital. This claim, for instance, is often made by residents of municipalities bordering Toronto. Hospitalization costs for indigent York County residents in 1933 had risen to the unprecedented total of $242,000, and for the first eleven months of 1934 had already reached $255,407.51. A definite move is now afoot to erect a public hospital in the county, and many advocate it on an economy basis, despite the fact that the county pays the city hospitals but $1.75 per patient, if indigency and residency cannot be contested, while the average *per diem* cost of the ten Toronto public hospitals, as given in the 1933 government report, is $3.22. Actually the hospitals care for such patients at less than cost, yet are criticized because the total account is growing. It is not likely that the operation costs of a suburban hospital would reach $3.22 per patient-day, because many costly facilities might not be made available; however, without these facilities higher-priced private patronage would not be heavy, and, moreover, many county residents would probably be treated who are now treated by city hospitals and for whom, for one reason or another, the county does not now pay. Another reason for which a county hospital is urged is the delay in getting free tonsillectomies done at the city hospitals. Undoubtedly, the overworked and unpaid staffs of the departments involved would welcome this respite, but a less costly arrangement for this need might be effected, perhaps by permitting tonsillectomies at home to come under relief payment provisions, or by the setting up of a special clinic, perhaps of a temporary nature, and the provision of a fair remuneration for those providing the medical service.

All communications intended for the Department of Hospital Service of the Canadian Medical Association should be addressed to Dr. Harvey Agnew, 184 College Street, Toronto.

These situations, suburban and rural, could be applied to a number of communities in Canada. The grant to public hospitals, sometimes itself an inducement to build, is also utilized as a deterrent, for, in several instances, provincial governments, by declining to promise the *per diem* grant, have successfully discouraged quite unnecessary construction. Also one province, Ontario, has encouraged the construction of convalescent hospitals by authorizing municipal and provincial *per diem* grants towards them under the Hospital Act. It would be a sad day indeed when governmental or other central jurisdiction would stifle local enterprise and philanthropy, but some arrangement which would permit the proper correlation of all hospital construction and endeavour, which would minimize duplication where it interferes with efficiency, which would meet all of the hospital needs in any area, and which would direct philanthropic effort towards these objectives would mark a distinct milestone in hospital progress.

University Notes

University of Manitoba

At the Convocation of the University of Manitoba held on May 15th, 44 were awarded the degree of M.D.

Dr. H. K. Fiddler received the degree of B.Sc. in Medicine, and Dr. R. W. Richardson, the degree of Master of Surgery.

Mr. A. W. Andison, B.A., received the University Gold Medal in Medicine and also the Manitoba Medical Alumni gold medal for the highest standing in the first four years of the course. E. Therrien, B.Sc., obtained the Dr. Charlotte W. Ross Gold Medal for highest standing in Obstetrics during the course. Carl Graham Wood, B.Sc., won the Chown Gold Medal and $50.00 for the best aggregate standing on the subject of medicine throughout the course, and E. S. James, the Chown Gold Medal and $50.00 for the best aggregate standing in surgery. The Prowse prize of $250.00 for clinical research in medicine, open to under-graduates and graduates of not more than ten years' standing, was won by Dr. Byron Marcey Unkauf.

The degree of LL.D., *honoris causa*, was awarded to James Bertram Collip, M.A., Ph.D. (Toronto), D.Sc., M.D. (Alberta), F.R.S. F.R.S.C., Professor of Biochemistry and Pathological Chemistry, McGill University.

ROSS MITCHELL

McGill University

At the Annual Convocation of McGill University, held on May 30, 1935, the honorary degree of LL.D. was conferred on the following: O. T. Avery, B.A., M.D., D.Sc., of the Rockefeller Institute; A. S. Eve, M.A., D.Sc., LL.D., F.R.S., Dean of the Faculty of Graduate Studies and Research, McGill University; Hon. A. G. Godbout, B.A., B.S.A., D.Sc.A., Minister of Agriculture, Province of Quebec; Hon. W. J. P. MacMillan, M.D., C.M., Premier of Prince Edward Island; Rev. Abbé G. Lemaitre, Ph.D., Professor of Astronomy, University of Louvain.

One hundred and three students received the degree of M.D., C.M. The prize winners were as follows: William D'A. Maycock, Holmes Gold Medal for the highest aggregate in all subjects of the medical curriculum; the J. Francis Williams Fellowship in Medicine and Clinical Medicine; First Place Aggregate Standing in the Final Year. Michael Aronovitch, B.Sc., the Lieutenant-Governor's Silver Medal for the Highest Standing in Public Health and Preventive Medicine; the Jeanie Forsyth Prize for High Standing in Surgery; Second Place Aggregate Standing in the Final Year. Charles L. Yuile, B.A., the Wood Gold Medal for the best Clinical Examinations in the Subjects of the Final Year. Leslie R. Williams, the Alexander D. Stewart Prize of the Highest General Qualifications for the Practice of Medicine; Third Place Aggregate Standing in the Final Year.

In the Faculty of Graduate Studies the following received degrees or awards: Evelyn M. Anderson, M.A., M.D. (Univ. of California), Ph.D. (McGill), the Governor-General's Silver Medal in Biochemistry. S. A. Komarov, M.D. (Univ. of Latvia), Doctor of Philosophy (in physiology), John V. V. Nicholls, B.A., M.D., C.M. (McGill), Master of Science (in physiology).

University of Montreal

At a Convocation of this University, held on May 29, 1935, the doctorate in Medicine was conferred on thirty-five candidates. The following were the prize winners: Roland Dussault, Hingston Medal for highest Aggregate Standing in all Subjects of the Medical Curriculum; the Lachapelle Prize for the highest standing in the third, fourth and fifth years; Nadeau Prize for the best Intern Work; J. Eugene Barbeau, Lieutenant-Governor's Medal for the student obtaining the highest points in laboratory work; Yvon Corriveau, Second Prize for Intern Work.

University of Toronto

Medals, Prizes, Scholarships and Fellowships awarded by the Senate of the University in the Faculty of Medicine, June 3, 1935.—

Sixth year—The Faculty Gold Medal, F. H. Côté, B.A.; The Faculty Silver Medal, A. L. Chute, M.A.; The Ellen Mickle Fellowship, F. H. Côté, B.A.; The Chappell Prize in Clinical Surgery, F. H. Côté, B.A.; The William John Hendry Scholarship in Obstetrics and Gynæcology, F. H. Côté, B.A.; The Ontario Medical Association Prize in Preventive Medicine, F. H. Côté, B.A.; The David Dunlap Memorial Scholarship, P. B. Hamilton, B.A.; The Canadian Medical Institute Prize, C. E. Vaughan, with M. R. Caverhill honourable mention.

Undergraduate.—The David Dunlap Memorial Scholarships: (*a*) Fifth Year, I. M. Hilliard, B.A., (*b*) Third Year, J. E. Howes; The Ronald S. Saddington Medal in Pathology, W. L. M. King; The Baptie Scholarship, J. C. Rathbun.

Graduate.—The Reeve Prize, C. E. Dolman, M.B., B.S.(Lond.), M.R.C.P.(Lond.), D.P.H. (Lond.); The Lister Prize in Surgery, R. C. Laird, B.A., M.D.; The Perry Goldsmith Prize in Oto-Laryngology, H. H. Burnham, M.B.; The Starr Gold Medal, A. W. Ham, M.B.; The J. J. Mackenzie Fellowship in Pathology and Bacteriology, J. C. Paterson, M.D.

Special Correspondence

The Edinburgh Letter

(From our own correspondent)

The appointment of Mr. John Buchan as Governor-General of the Dominion of Canada has created a great deal of interest in Scotland. He is one of the most widely known of contemporary Scotsmen. He was educated at Glasgow University and later proceeded to Oxford, where he entered Brasenose College. His career at Oxford was a most distinguished one. During his last year he was President of the Union. From 1901 to 1903 he was Private Secretary to Lord Milner, High Commissioner for South Africa. On his return to Scotland he devoted himself to literature, in which he has achieved a high reputation. During the War he acted for a time as a special correspondent and was later appointed to the Headquarters' Staff, with the rank of Lieutenant-Colonel. In 1919 he received the degree of LL.D. from Glasgow University, and in 1930 a similar distinction was conferred on him by St. Andrews University. He is one of the representatives in Parliament of the Scottish Universities. Mr. Buchan has represented the King as Lord High Commissioner to the General Assembly of the Church of Scotland. His appointment to an administrative sphere which ranks as one of the most important in the British Empire is a fitting climax to a career of unusual versatility and brilliance.

Prof. J. Graham Kerr, Regius Professor of Zoology in Glasgow University, has been adopted by the Unionist Associations of the Scottish Universities as the prospective candidate for the vacancy in the Parliamentary representation of the Universities caused by Mr. Buchan's appointment. On this occasion it was generally felt that a medical man should, if possible, be nominated. Professor Kerr is not a medical graduate, though for some years he was a medical student. He is, however, a teacher in the Medical Faculty and takes a great interest in medical politics.

Prof. E. P. Cathcart, C.B.E., M.D., D.Sc., LL.D., F.R.S., Regius Professor of Physiology in Glasgow University, has been appointed Chairman of the Departmental Committee on Health Services by the Secretary of State for Scotland in succession to the late Sir John Dove Wilson. Professor Cathcart gave an address on "Food and Nutrition" at the Annual Conference of the Scottish National Health Visitors Association, held at Stirling recently. We might dream of a race, he said, fed on the food of the gods, reaching a stature and beauty unknown to our time. But dreams and visions they must remain. Strive as we might, there was no road that led to that Utopia, because we were up against heredity, grim, immutable and inexorable. No amount of feeding, no excellence of diet, would ever convert the bantam chick into the ordinary barnyard fowl. He warned his audience that all the chatter they heard today had very ill effects in making sensitive people food-conscious. Such persons became food-conscious, then food faddists, and finally missionaries *in excelsis*. Stressing the importance of an adequate amount of proteins, carbohydrates, and fats in the average diet, Professor Cathcart said that as regards fats they would find a direct relationship between its consumption and economic status. The more money people had to spend, the greater amount of fat consumed, and at no time during the history of the human race had so much fat been consumed as in recent times. The increase had taken place in the past thirty years, and to this was probably due the fall in the death rate from tuberculosis. He concluded by saying that he was certain there was an immense amount of malnutrition among widows and unmarried daughters of men who had once been in comfortable circumstances and were now eking out an existence on a minute income.

Glasgow University Court recently made two important appointments. Dr. Arthur J. Ballantyne has been selected as the first Professor of the Tennent Chair of Ophthalmology, of which subject he is at present lecturer. The endowment for this Chair was provided in the will of the late Dr. Tennent in 1914, but it has

only now been possible to appoint a Professor. The foundation for the Professorship includes an ophthalmology wing in the Glasgow Western Infirmary. Professor Ballantyne has been appointed President of the Section of Ophthalmology at the Annual Meeting of the British Medical Association to be held at Melbourne in September.

Professor T. Alty, at present Research Professor of Physics in the University of Saskatchewan, has been appointed to the Cargill Chair of Applied Physics in succession to the late Professor J. G. Gray.

A Committee, the first of its kind, has just been formed for the purpose of dealing with the problem of impaired vision in Scotland. The scope of the inquiry to be undertaken by the Committee includes schools and factories The organization has been named the Scottish Conservation of Sight Committee, and the members are representative of medical, educational and other interests.

R. W. CRAIG.

7 Drumsheugh Gardens,
Edinburgh.

The London Letter

(From our own correspondent)

The events of Jubilee week and after are scarcely of special significance for medical men except in so far as they are ordinary citizens, but of very great importance to the profession was the visit of Their Majesties to Hammersmith in the week following the main celebrations to declare open the new Post-Graduate Medical School there. The past history of this institution has been mentioned from time to time in these letters. It was first recommended in its present form by the Athlone Committee in 1921 and in its final evolution the Government, the University of London and the London County Council have all played important parts. The new school will afford a rallying place for all post-graduate visitors from abroad as well as providing the necessary instruction for our own practitioners who require either special knowledge in some subject or wish to have a "refresher course" on general lines. One such course for insurance practitioners to last for fourteen days in June has already been planned and several more are to be held during the year. The new school will be able through its staff to provide for most of the teaching but for special subjects the students will often be sent by arrangement to other hospitals, such as the Hospital for Sick Children, Great Ormond Street. One feature of the new school has perhaps been insufficiently stressed and that concerns the research side of the work there. It is the intention of the founders that the scientific side of medicine shall be developed and young graduates will be given suitable opportunities for following lines of research or preparing themselves for academic positions in the medical world. Already visitors from all over the globe have arrived or inquired about the new centre and now that the official opening is over its work is quickly getting into a full stride.

The above remarks may be interpreted as meaning that for the time being at any rate the question of post-graduate medical education is largely settled. It is far from being so in the case of the medical undergraduate. A recent gathering of medical students from all the hospitals of London debated the whole subject of the medical curriculum, expressing dissatisfaction with much of it in no uncertain terms. A few days after this the eagerly-awaited report of the "curriculum conference" was issued and herein there is much food for thought. It was about two years ago that the medical faculty in London set up this conference as a result of widespread grumbling at existing affairs. Realizing that what London decided would affect a wider circle the authorities wisely brought in representatives from the Universities of Oxford and Cambridge, the English Royal Colleges and the Society of Apothecaries. The report is searching in its recommendations and it may be summarized not unfairly by saying that it is in the spirit of the curriculum rather than in the letter that changes are suggested. In theory, for example, all students must at present spend a certain time in special departments such as those dealing with diseases of the skin, the eye, or the ear, nose and throat but the average undergraduate, knowing that the chances of a question in his final examination on these subjects are small, prefers to slack away from such work and put in more time at the ordinary surgical and medical clinics. The report recognizes that this is a stupid way to train general practitioners and urges that it be remedied in the only manner likely to persuade the student, namely by making special subjects a necessary part of the final tests. Along two other lines the report makes wise suggestions. For example, the so-called casualty department of a big hospital contains a much more accurate picture of the type of patient met with in the day-to-day life of a practice than the wards or the special medical or surgical out-patients clinics dealing with selected cases. It is therefore urged that the so-called minor ailments be given much more attention. The second important recommendation concerns the now accepted plea for better and more extensive psychological equipment for the general practitioner. The conference has also taken a leaf out of the book of the European schools by suggesting that post-graduate experience in an

approved hospital should be compulsory before a doctor is allowed to go into practice.

What is the truth about malnutrition in this country? The matter has been mentioned before in these notes, but the answer to the question is still not an easy one to give. It is true that politicians assert either that things are improving all round or that things are as bad as they can be, according to the political creed held. The official reports and the correct official view is that except for some definite deterioration in the mental health of certain of the population in the worst unemployed areas the country as a whole and these areas in particular do not show any evidence of worsening in physical well-being. On the other hand last December a practitioner in the north wrote to *The Times*, stating that in his part of England there had been a substantial and progressive deterioration in public health despite resolute, competent and generous local efforts, and he suggested that the country as a whole was in danger of becoming complacent about the distressed areas. This point of view was so much at variance with the official one that the Ministry of Health sent three investigators to look into the matter on the spot. They failed to find support for the practitioner's statements. This is characterized by another correspondent of the medical press as a cheap and hollow victory for the powers that be. The Committee Against Malnutrition at a recent meeting decided that on the whole there was much evidence of what is termed a sub-optimal condition of health and the stress was laid there on the economic rather than the physiological side of the problem. The profession as a whole prefers to keep clear of the economic or political aspect, but the time is perhaps coming when sides will have to be taken. Health should not be a matter of votes but a common right. What is first wanted, as has been said before, is some sort of unassailable standard of health and nutrition. Then both sides would have to agree on the facts.

ALAN MONCRIEFF.

121 Harley Street,
London, W.1.

SOLID WEALTH

Thieves may break locks and with your cash retire;
Your ancient seat may be consumed with fire;
Debtors refuse to pay you what they owe,
Or your ungrateful field the seed you sow;
Your faithless maid may plunder you by stealth;
Your ships may sink at sea with all your wealth;
Who gives to friends so much from Fate secures,
That is the only wealth forever yours.—Martial.

Letters, Notes and Queries

The Relation of Calcium and Magnesium to Cancer

To the Editor:

The reports of Wright and Craig in your issues of October and November, 1934, respectively, giving results of the use of magnesium salts in cancer therapy, however conservatively they be received, must be taken as corroborative in some measure of the claims advanced by various investigators that magnesium has some bearing on cancerous conditions. Professor Delbet, of Paris, who is cited by Craig, has long held that malignancy in animals bears a direct relation to magnesium deficiencies in diet. Among his other activities he has published from time to time the results of studies purporting to show an inverse relation between the prevalence of magnesium in soil and water supplies and cancer mortality in certain small communities whose inhabitants would normally subsist on the products of the soil in their immediate neighbourhood. Although the criticism supported by similar investigations that has been levelled at Delbet's theories indicates that he has not reached the heart of the kernel, work such as that of Wright and Craig goes far to point out the avenue along which investigation might well be directed. The fact as observed by Wright that magnesium salts (the sulphate) are finding routine use in the treatment of leukoplakia, verrucæ, and papillomata in Stockholm cannot be dismissed lightly. In this connection, however, it is worth drawing attention to the recognized effectiveness of saturated solutions of magnesium sulphate in the treatment of skin infections and local inflammations.

Some authorities consider that there is a very definite relationship between neoplasms and calcium deficiencies in many observed cases of hypoparathyroidism. This lends support to the supposition that the rôle of magnesium, whatever its mechanism, may well be closely shadowed by that of calcium.

The behaviour of certain of the compounds of calcium and magnesium, when associated, is of rather compelling interest in the light of the facts cited above. To digress into the realm of the mineralogist,—it is a fact not always appreciated that the mineral dolomite wherein occurs the predominant part of the earth's supply of non-igneous magnesia is a compound consisting of equimolecular properties of calcium and magnesium carbonates. Although the name is applied rather loosely to mechanical mixtures of dolomite with an excess of either component, the

Answers to questions appearing in this column should be sent to the Editor, 3640 University Street, Montreal.

great bulk of the earth's so-called sedimentary magnesia occurs as the molecular compound $MgCO_3$. $CaCO_3$. This dolomite has certain physical properties, reflected largely in chemical stability, which show enhancement over those of the individual constituents. Perhaps the most noteworthy is the increased thermal stability of the magnesium carbonate component as manifested in the fact that when combined as dolomite its thermal decomposition point is raised by over 75 degrees. Many hypotheses have been put forward to explain the origin of dolomite, and it is probable that in the case of secondary deposits more than one of them is right. Many investigators ascribe its occurrence to factors other than co-deposition of the two constituents as a function of solution equilibria and mass action. It is not inconceivable that the dolomite that the drillers of oil wells encounter in their search for the product of the decomposition of animal organisms arises from a similar source.

I am not aware of any analyses of animal protoplasm or body substance which show a consistent ratio between calcium and magnesium. As one who has had occasion to make a considerable number of analytical separations of calcium and magnesium, I would be inclined to be conservative as to the accuracy of many micro-analytical determinations of the ratio of components occurring in such minor proportions.

A second phenomenon in the behaviour of systems involving calcium and magnesium compounds is worthy of emphasis. In the commercial preparation of "magnesia alba levis" advantage is taken of the fact that when equimolecular proportions of calcium and magnesium hydroxides, as derived from dolomite, are subjected to the action of carbon dioxide in water suspension the magnesium may be removed from the system as the soluble bicarbonate, while the calcium remains behind as a normal carbonate. Re-carbonation of the latter while in a comparatively pure state will, as is well-known, effect its solution. The magnesium in this case serves as a protectant of the calcium. A similar function has been ascribed to magnesium in preventing decalcification of the teeth.

Work in the field of soil chemistry has indicated a very definite relation between calcium and magnesium in plant metabolism. One investigator has reported indications that the observed toxic effect of magnesium occurs in the absence of calcium. It has even been authoritatively reported that magnesium in the absence of calcium resulted in the growth of "freaks" and monstrosities. More recent work on the effect of magnesium in the diet of rats has shown that detrimental physiological effects are minimized by additions of calcium. If an optimum ratio between these elements could be defined it would be of the utmost interest.

To attempt a parallel between the above facts and the incidence of malignancy in animal organisms requires temerity indeed. The cumulative nature of malignant growths, as manifested by their rapid infiltration into adjacent tissue, in its most elementary interpretation points to any causal deficiencies being augmented by the condition itself. If calcium deficiency were involved, the decomposition of protoplasm through mechanical or chemical causes would supply simpler fatty acids which could be effective for its local removal. With a malignancy established the lactic acid formed could accelerate the process. The observed effectiveness of readily hydrolyzable magnesium salts in cancer therapy might then be due to a protective effect.

The fact that the chloride and sulphate of magnesium have both been used with favourable results may have some significance. There appears to be little to justify theories based on any concept of valency, as, contrary to the suggestion of Craig, magnesium and calcium are invariably bivalent. Magnesium, and to a lesser extent calcium, is readily precipitated as the hydroxide from its inorganic salts under slightly elevated pH's. Again the phosphates are comparatively insoluble in alkali media. The rôle of phosphorus in calcium metabolism is well-recognized. To a chemist rather far from his field the idea of using definite ratios of calcium and magnesium salts in cancer therapy rather than magnesium alone suggests itself. It might be that further exploration would indicate that the calcium-phosphorus ratio should also take cognizance of magnesium.

A. F. GILL.

National Research Department,
Ottawa, April 25, 1935.

Topics of Current Interest

A Mother's Right to Her Child

The birth of quintuplets in the Province of Ontario has raised an unusual problem. The legislature of Ontario wants to make them "wards of the King", a form of nationalization with which the parents disagree. It is not quite clear whether the new law is intended to prevent the parents from exploiting the exhibition of their progeny, or whether the State desires to acquire the babies as objects of rarity and vertu like the Codex Sinaiticus. The mother protests that already, when she goes to see them at the hospital, she is treated as a stranger. If there is no complaint against her character or her home, has not a mother an inalienable right to her children? Oddly enough, this very question has lately been before the London law courts "in the matter of Jean Crichton, an infant." Jean's mother, owing to the exigencies of her work, placed Jean with a Mrs.

Hinckes and made adequate provision for her child's maintenance. The time came when Mrs. Crichton was in a position to make a home for Jean, and she asked for her return. The little girl, however, did not want to leave Mrs. Hinckes, and Mrs. Hinckes did not want to part with her. Mr. Justice Atkinson made an order giving Mrs. Hinckes the custody of the child, subject to an arrangement for Jean to visit her mother at holiday times. On an appeal against the order, two judges of the King's Bench Division allowed the mother's claim. They did not see how they could take away a child from a mother against whom there was no complaint. The wishes of a young child were not the only point to consider. There could be nothing against the mother, said Mr. Justice Singleton, since the order recognized that she was fit to have the custody of her child at holiday times. It was natural enough, said Mr. Justice Talbot, that Jean might be unwilling to leave Mrs. Hinckes, and that Mrs. Hinckes might be unwilling to lose Jean, "but I think the Man in the Street would be surprised to hear that there was any doubt about the matter." It has caused some astonishment in Lincoln's Inn and the Temple that the views of the Man in the Street should have been allowed to intrude into the administration of the law, but there is not much doubt which way a jury of mothers would decide. The case is to be taken to a higher court and the hearing of the appeal is being expedited.—*The Lancet*, 1935, **1**: 690.

The Menace of Codeine

Editor, *Sun*:

Sir,— Recently I have cured myself of a two-year narcotic habit, or, in the parlance of those addicted to any habit-forming drug, have "kicked a tough habit." Believe me, it would be impossible to convey to anyone the mental torture along with the physical pain and torment that unites to make this one of the worst ordeals that a human could endure,

Every now and then I read in your paper of some poor character arrested, tried, and punished for the possession of a narcotic in some form. Strange to say, a drug is purchasable in nearly all the city drug stores. I refer to the drug codeine. Lately there has been a slight stir in legal circles to ban, or rather enter this drug on the poison list—that's all, just talk. Codeine, while not being equally as strong as morphine, heroin or opium, can be injected hypodermically in the human system in a vaster quantity, thereby making it a more insidious evil.

I could devote pages to describe the effects, but suffice to say, it is every bit as habit-forming as the drugs above-mentioned, and racks the system to a greater extent than a stronger drug . . . .

Now, don't you think, Mr. Editor, this evil should be stamped out? It is surprising the many youngsters that are indulging in this dangerous pastime.

You will not credit it, but just the other day I saw a young couple, the lad could not be more than 20 years old, and the girl the same age, making a purchase of codeine. This is where our new civic administration could really do some good.

I am just an old reprobate trying to do a good act. OLD REP.

This is a clipping from the *Vancouver Sun*, kindly sent us by Col. J. H. L. Sharman, of Ottawa. It will be of interest to our readers in connection with the campaign against codeine addiction. [ED.]

The President's Plans for Economic Security

With all other American citizens, the medical profession awaited eagerly the message which the President of the United States delivered, January 4th, to the joint session of the Senate and the House of Representatives. In spite of the obvious impossibility of absolutely definite statements because of the very nature of our government, the President, nevertheless, provided an indication of the character of the program contemplated in relationship to economic security. His plans seem to provide for the provision of work to many of the unemployed, the projects including such matters as slum clearing, reforestation and elimination of grade crossings, as well as many local projects. All of these have, of course, a definite interest for the medical profession. In fact, the housing projects and the elimination of the grade crossings must inevitably have a definite effect on morbidity and mortality rates.

Of special interest to the medical profession, however, were those paragraphs of his address in which the President referred particularly to questions of sickness and related problems. Thus he said:

> Closely related to the broad problem of livelihood is that of security against the major hazards of life. Here also a comprehensive survey of what has been attempted or accomplished in many nations and in many states proves to me that the time has come for action by the national government. I shall send to you, in a few days, definite recommendations based on these studies. These recommendations will cover the broad subjects of unemployment insurance and old age insurance, of benefits for children, for mothers, for the handicapped, for maternity care, and for other aspects of dependency and illness where a beginning can be made.

It is perhaps unwise to analyze too closely the significance of this statement. Interesting, however, is the manner in which the President passed immediately from unemployment insurance and old age insurance to the question of benefits for children, for mothers, for the handi-

capped and for maternity care, leaving the question of sickness insurance to the phrase in which he says "for other aspects of dependency and illness where a beginning can be made." The element of time in relationship to the development of any definite plans of sickness insurance is of the utmost significance. There seem to be indications that the difficulties involved in developing schemes for providing persons in the lower wage levels with adequate medical care and at the same time preserving the quality of medical service and the integrity of the medical profession are far greater than they seemed to be at first glance to those who urged precipitate action. Innumerable experiments are now going on in many communities under local, industrial and similar auspices, including those conducted by county medical societies. Time has not yet permitted a real evaluation of their worth, yet their multiplicity is an indication of the extent and the complexity of the situation. Moreover, the employment of considerable numbers of people now unemployed and the establishment of unemployment insurance, old age pensions, and the other factors mentioned in the program of social security will modify greatly the features of any plan for sickness care that may be developed.

The number of competent minds that have already been brought to bear on the solution of this problem should eventually yield at least a suitable experiment if not a complete solution. More than anything else the medical profession fears hasty action and the setting up of some scheme which, once established, will ride, like the old man of the sea, on the back of medical progress and impede its advancement. We have already witnessed the spectacle of hastily devised programs in foreign countries now undergoing constant repair. Eventually there must be some solution that will adequately serve the people and at the same time not sap the life blood of the medical profession.—*J. Am. M. Ass.*, 1935, **104**: 122.

APHORISMS FROM MILTON

As good almost kill a man as kill a good book. Many a man lives a burden to the earth; but a good book is the precious life blood of a master spirit, embalmed and treasured up on purpose, to a life beyond death.

Truth is as impossible to be soiled by any outward touch as the sunbeam.

Nor live thy life, nor hate; but whilst thou liv'st
Live well; how long, how short, permit to heaven.

Solitude is sometimes best society,
And short retirement urges sweet return.

Medico-Legal

IX.

Jarvis v. International Nickel Co.*

Ontario—Mastoiditis—Responsibility of owners of a hospital for negligence of its staff—Standard of care—Duty of physician who is unable to diagnose a disease to call in a specialist.

This was an action by an employee against a company that had undertaken to supply its staff with medical and surgical treatment, and against their medical superintendent, on the ground of negligence in the treatment of the employee. The defendant, McCauley, was a medical practitioner employed by the company as superintendent of a hospital maintained by it at Copper Cliff. The company deducted a certain amount from the plaintiff's monthly salary, and undertook to provide medical care for him and his family should any of them become ill while the plaintiff was in the company's employ.

In August, 1924, during a convalescence in the company's hospital from an operation for appendicitis, the plaintiff was seized with violent pains in the head and his ear began to discharge pus. This went on until he was removed to London, Ont., where a specialist operated and discovered a severe mastoiditis. The plaintiff's recovery from the operation was slow, and he claimed that his nerves were seriously affected and that he suffered from partial facial paralysis, a lack of control over the movement of his eyes, was slightly deaf, and was affected in his speech.

The plaintiff based his action against the defendant company upon a contract whereby it agreed to furnish him with medical and surgical treatment in case of illness, in consideration of deductions from his salary, and in consequence of which it was alleged that the company was responsible for the negligence of doctors employed by it. To this the Court said "I find upon the evidence that the physician and surgeon provided by the defendant company for the treatment of the plaintiff were competent, and that in the selection of its staff the company exercised due care and skill . . . All that the defendant company, in my opinion, undertook to do was to provide competent physicians and surgeons, and it did not warrant that in all details of treatment these physicians and surgeons would exercise reasonable care

* Ontario Supreme Court, Wright, J. (1929) 63 O.L.R. 564 and (1929) 2 D.L.R. 842.

and skill. The test, as I take it, is whether in selecting its medical staff it exercised due care and skill, and I find that in the present instance it did exercise such care and skill.'' No case therefore has been made out against the International Nickel Company.

The allegations against the defendant Dr. McCauley were, that he was negligent in not diagnosing the mastoid trouble within a reasonable time after the symptoms first appeared, and that, if he were not competent to diagnose a mastoid condition himself, he should have called in a specialist who was competent. On the evidence the court held that the doctor had in fact failed to diagnose the mastoid condition, and that, although he was unable to discover the real cause of the trouble, he failed to call in a specialist as most doctors would have done. In examining if a physician has been negligent in a given treatment it is necessary first to inquire into the standard of care required of the medical practitioner. It is now agreed that all that the practitioner is required to bring to the performance of his duty is reasonable care and average skill, and that he is not responsible merely because some other practitioner of greater skill and greater knowledge might have prescribed a different treatment. Of the defendant McCauley, as superintendent of a hospital, a higher degree of skill would be expected than from the average general practitioner. However, since mastoid trouble is difficult to diagnose in its early stages, and since there was no evidence that a competent medical man should have diagnosed the trouble, the Court held that upon the evidence it could not find that there had been a lack of reasonable skill.

The more interesting point, however, was the plaintiff's allegation that the defendant, being unable to diagnose the trouble himself, should have called in a specialist. The court criticised the defendant's omission to summon a specialist, but said ''I have failed to find in any of the authorities any support for the proposition that if a physician in charge of a case is unable to diagnose the trouble he is under legal obligation so to inform the patient and to advise the calling in of a specialist . . . . In my view, when the doctor brings to bear upon the treatment of the patient a reasonable degree of skill and care under all the circumstances, he has discharged his duty''.* The plaintiff's case was dismissed, therefore, as regards both defendants. (G.V.V.N.)

* The analogy here with the case of *Moore and Moore v. Large* (See *Canad. M. Ass. J.*, 1935, **32**: 212) may be noted. There it was held that in cases of suspected dislocation of the shoulder the physician is not obliged to have an x-ray taken when he is convinced, by the use of the usual tests approved by the profession, of the real cause of the trouble.

Abstracts from Current Literature

Medicine

Inversion of the T Wave in Lead I or II of the Electrocardiogram in Young Individuals with Neuro-circulatory Asthenia, with Thyrotoxicosis in relation to certain Infections and following Paroxysmal Ventricular Tachycardia. Graybiel, A. and White, P. D., *Am. Heart J.*, 1935, **10**: 345.

In this article are presented 23 cases in which significant inversion of the T wave of the electrocardiogram was not associated with the usual known causes for such inversion. The history, physical examination, roentgenological and laboratory data were used to eliminate instances of organic heart disease, which are well-known to cause inversion of the T wave. All the patients were young, and in most instances were repeatedly examined over months or years. The associated findings were neuro-circulatory asthenia, thyrotoxicosis, infection, or paroxysmal ventricular tachycardia, but in no case did there seem to be any evidence that these findings were even secondarily responsible for T-wave inversion. No cause was found in any case to explain the electrocardiographic changes. It is concluded, therefore, that this finding points to the need of caution in the diagnosis of serious heart disease when inversion of the T wave in lead II of the electrocardiogram is the only abnormal finding.

W. H. HATFIELD

The Symptomatology of Myxœdema: Its relation to Metabolic Levels, Time Intervals, and Rations of Thyroid. Means, J. L. and Lerman, J., *Arch. Int. Med.*, 1935, **55**: 1.

Myxœdema having acquired a fresh importance because of its artificial production to relieve overburdened hearts, information concerning the relation of symptoms to metabolic rates, time intervals, and thyroid rations becomes necessary. The Boston Clinic has patients who have done well on thyroid rationing as long as twenty years.

Spontaneous myxœdema presents a characteristic picture—a broad-shouldered, short-necked person of amiable disposition, with a good sense of humour. The basal metabolic rate is constant, unchanging, unless under treatment. Below minus 30 is the zone of complete myxœdema, although the basal metabolic rate, following more rapidly the development of symptoms, may reach this zone before a clinical diagnosis can be made. Between minus 20 and minus 30 one finds so-called early symptoms. At plus 10 hyperthyroid symptoms may be observed. In the study of thyroid rationing it was found that ½ a grain daily will keep the typical patient at minus 20

with slight symptoms; 1 grain daily at minus 10; 1½ grains at minus 5; 3 grains at zero. If thyroid is stopped the level drops from zero to minus 30 in seventy days or more. Return of symptoms comes much later because they are not related to the calorigenic action of thyroxin, which decides the metabolic rate.

Complete removal or atrophy of the gland is necessary for the development of myxœdema. People showing symptoms with a constant minus 20 reading, which is not in the myxœdema zone, probably owe their lowered rate to something outside the thyroid. Borderline cases of myxœdema are very rare.

Where myxœdema develops before the menopause menorrhagia is not uncommon.

Thyroid rationing will be useful in managing heart cases where artificial myxœdema has been produced, and the basal rate must be kept at a safe level. P. M. MACDONNELL

Surgery

The Schilling Hæmogram in Appendicitis. Carlson, H. A. and Wilder, L., *Arch. Surg.*, 1935, **30**: 325.

There has been much disagreement concerning the value of blood counts in the diagnosis of acute appendicitis. Recently the value of the Schilling hæmogram has been investigated.

In 1891, Ehrlich formulated the differential count now commonly used, which classifies cells into lymphocytes, monocytes, polymorphonuclears, eosinophiles and basophiles. In 1904, Arneth discovered that the variations in the nuclear structure of the polymorphonuclear leucocytes can be correlated with the severity of the disease. His was an extensive classification of the neutrophiles according to the number of lobes and their shape, but was much too complicated. It served as a basis, however, for further studies. In 1912 Victor Schilling devised a satisfactory simplification of the Arneth index, dividing the neutrophiles into four classes, according to the state of immaturity of the nucleus. These four groups are (1) myelocytes; (2) juvenile forms, which are the "metamyelocytes" of Pappenheim; (3) stab- or band-forms having no definite nuclear lobulations; and (4) mature segmented cells. According to recent work the Schilling index is of more clinical value than the older Ehrlich method, in detecting the presence, the degree, and the persistence of infection in surgical lesions. The Schilling hæmogram is a relatively simple index for recording the reaction of the bone marrow to infection or to toxic stimuli. In this count, the lymphocytes, monocytes, eosinophiles and basophiles are listed as in the Ehrlich differential count, but the neutrophiles are further classified into segmented forms, stab-cells, juvenile cells, and myelocytes. In infectious diseases, neutrophiles enter the blood stream in earlier stages of development than normally, so that there is an increase in the number of stab-cells and juvenile cells, and even myelocytes may appear, the presence of the latter indicating a severe infection.

The authors conclude that in appendicitis the Schilling hæmogram is a better index of the severity of the disease than either the temperature or the pulse rate.

G. E. LEARMONTH

Thrombo-angeitis Obliterans. Telford, E. D. and Stopford, J. S. B., *Brit. M. J.*, 1935, **1**: 863.

Thrombo-angeitis obliterans is a definite clinical entity belonging to the vaso-spastic group of vascular lesions. It is a chronic occlusive lesion affecting at first the medium-sized arteries of the lower limbs. It is rarely seen in the arms. Less than 1 per cent of cases are in females. It does not show a racial predilection. Occupation has no direct relation to the disease. The authors' report a study of some 200 cases.

Claudication appeared at an average age of 45. The course of the disease is variable. It is usually chronic, progressing by exacerbations, with long periods of arrest. Prognosis is therefore difficult. The trouble is first noted in one leg. As the disease progresses the patient can walk for shorter and shorter distances. Only a short rest is needed to obtain relief from claudication. Coldness and whiteness of the feet may precede claudication. After claudication has developed the dependent foot becomes discoloured. Raising the foot above the heart level causes it to blanch; the more rapid the colour changes, the more advanced the disease. Finally rest pain develops, particularly when warm in bed. Ease is obtained by allowing the foot to hang over the edge of the bed in cool air. About 50 per cent develop trophic changes. Thrombophlebitis was seen in not more than 10 per cent. The cause is unknown. The disease is probably a spasm followed by thrombosis. Syphilis has no part in the lesion. Tobacco cannot be the sole direct cause.

All forms of physiotherapy are merely temporary palliatives. No drug by mouth appears to have any effect. Adrenalectomy, high ligature of the femoral vein, and perivascular sympathectomy have failed. Excision of the lumbar ganglionated cord was done in 48 cases, in 42 being bilateral. Twenty-five patients were free from rest pain, could walk well, and many had returned to work; 7 showed lessened rest pain but little or no effect as regarded walking; and 10 cases were unsuccessful.

Sympathectomy abolishes spasm and dilates collaterals still capable of enlargement. The best results are to be obtained in the younger patients and in those cases where the spastic element is well defined. STUART GORDON

Clinical Use of a Plastic Pylorojejunostomy in Chronic Duodenal Ulcer. McWhorter, G. L., *Arch. Surg.*, 1935, **30**: 528.

The author believes that a plastic pylorojejunostomy with excision of the ulcer offers considerably less risk than a gastric resection. This will also allow side-tracking the ulcer with a more normal gastric function and less danger of jejunal ulcer than by closing the pylorus and performing a gastrojejunostomy. Experiments suggest that a jejunal ulcer could be less than one-half so likely to occur after a properly performed end-to-side pylorojejunostomy than after a gastrojejunostomy.

In the healing of chronic peptic ulcer there are four fundamental objectives: first, rest to the ulcer; second, improvement of the local blood supply; third, removal of the cause, and, fourth, restoration of normal gastric function. The method of plastic pylorojejunostomy described here permits excision of the ulcer without resection of the stomach. If excision of the ulcer is not advisable the duodenum may be closed above the ulcer, which can be resected later. McWhorter reports a case in which a plastic pylorojejunostomy was performed with resection of a chronic perforating ulcer of the posterior wall of the duodenum into the pancreas. The result was good.

G. E. LEARMONTH

Gynæcology and Obstetrics

Obstructive Lesions of the Uterus and Their Complications. Curtis, A. H., *Surg., Gyn. & Obst.*, 1935, **60**: 930.

Obstructions of the cervix are much more common than are usually recognized. The subsequent pathological changes, due to a damming back of uterine secretions, may be far reaching. Cases are cited to show the development of carcinoma, pelvic endometriosis, uterine polyps, adenomyosis, and other conditions from these obstructive lesions.

Stenosis of the cervix is most commonly seen following treatment for inflammatory lesions, *i.e.*, endocervicitis, although the most dense fibrotic constrictions have been found in virgins in whom no instrumentation had been done. Occasionally tumours have been the etiological factor which interfered with free drainage. Above the stricture a metaplasia of the columnar epithelium, either of the canal or fundus, to squamous epithelium is often seen. This is considered an explanation for squamous-celled cancer of the endocervix or fundus.

The author warns against the danger of cauterization of the cervix, applications of radium, or indeed, of any repeated treatment, without careful follow-up to see that the canal remains patent.

ELEANOR PERCIVAL

The Management of Pre-eclamptic Toxæmia and Eclampsia. A Report of the American Committee on Maternal Welfare. *J. Am. M. Ass.*, 1935, **104**: 1703.

Approximately 4,500 women die annually in the United States from eclampsia or some associated toxæmia, and many others sustain permanent vascular and renal lesions which impair their health. The American Committee on Maternal Welfare, after careful investigation, believe that these toxæmias of the third trimester should be treated medically. Adequate antepartum care, which includes fortnightly examination of the urine, blood pressure, and weight, will in a large measure convert toxæmias into preventable diseases. A patient who does not gain more than twenty to twenty-five pounds in weight during her pregnancy rarely develops a severe toxæmia. Likewise if a patient's activities and diet are regulated, when the blood pressure shows a steady tendency to rise, most severe toxæmias will be avoided. If the blood pressure reaches 170/90 in spite of bed rest, a diet of milk and fruit juices, and proper elimination, labour should be induced, either medically with castor oil, quinine (not more than a total dose of 20 grs.) and possibly pituitrin in 1 to 2 minim doses. If the need is more immediate the amniotic sac may be ruptured, if there is no disproportion and the cervix is short, soft and patulous.

Should convulsions occur, morphine should be given at once, and the dose of 1/4 to 1/6 of a grain repeated every half hour until the respirations fall to 12 to 14 per minute. Some obstetricians give in addition 20 c.c. of a 10 per cent solution of magnesium sulphate intravenously or a similar amount of a 25 per cent solution intramuscularly every hour till convulsions are controlled. When convulsions have subsided, 250 c.c. of a 25 per cent solution or 1,000 c.c. of a 10 per cent solution of dextrose should be given intravenously. If labour has not set in and the child is viable it should then be induced either by rupturing membranes or some other means. Toxæmia itself is not an indication for Cæsarean section. The patient should be watched after delivery and given sedatives for fear that convulsions recur.

ELEANOR PERCIVAL

Pædiatrics

Enuresis. A Genetic Study. Frary, D. F., *Am. J. Dis. Child.*, 1935, **49**: 557.

This is a study of enuresis in 221 families of 59 different clans. The conclusions justified are that it is an inherited condition, dependent upon a pair of recessive genes. Just what the underlying hereditary factor is that causes a delayed development of bladder control is not known. Environmental factors play a rôle also. In the

milder cases, the age at which the enuresis is controlled is largely determined by the environment. The severe cases apparently run their course regardless of training. In the latter type restriction of the total fluid intake proves helpful. This is not a cure, but merely a means of aiding in restricting urinary output, as evidenced by the fact that when the fluid intake is increased the enuresis recurs in most cases. Since the data indicate that enuresis is hereditary in origin rather than a conduct disorder for which the parent or child are responsible, and which can be overcome by analyzing the emotional conflicts of the child, the physician's and mother's attitude to the child is altered, although the treatment of the case itself may be the same. The child receives a new impetus toward bladder control when he realizes that it is not entirely his fault, and that he is not to be blamed for naughtiness or carelessness.

The data on which the conclusion as to enuresis being a recessive is based are too extensive to do more than outline them briefly. Biometric studies were made on the 112 families in which both parents were normal, but in which one or more children had enuresis. The expectations in such cases are 25 per cent of the children affected. Actually there were 36 per cent affected, but when one corrects this number for the families in which the parents were carriers, but in which chance gave only normal in place of one quarter of the children affected, the 36 per cent was reduced to 24.44 ± 1.16 per cent. Thus the observed percentage agrees extremely well with the expected 25. The number of affected in these families was 163, and the theoretical number should have been 166.72 ± 7.13. Thus the actual number was well within the limits of the theoretical expectations. The hypothesis that enuresis is dependent upon a recessive gene is warranted. A severe type of enuresis in identical twin girls aged 13 is recorded. Environmental influences especially the attitude and intelligence of the parents are secondary but important factors which may alter the course of the disorder.

MADGE THURLOW MACKLIN

Solitary Congenital Air Cyst of the Lung. Blatt, M. L. and Jacobs, H. M., *Arch. Pæd.*, 1935, **52**: 250.

Cystic disease of the lung is rare, only some 132 cases appearing in the literature up to date, including that described by the present authors. It may be remarked that the first case was reported by Bartholinus as far back as 1687. The importance of the condition lies chiefly in this, that one should remember the possibility of its presence in all cases with signs suggesting massive collapse or pneumothorax.

The authors report a case in a coloured female, four months old. This child had had a hard dry cough that was getting progressively worse, finally being accompanied by vomiting. There was no familial history of tuberculosis, syphilis, or malignant tumour. On examination, the child was weak, toxic and cyanotic. Respiration was laboured. The right half of the chest was expanded in the extreme respiratory position, and the right intercostal grooves were obliterated. The respiratory movements were shallow and rapid, accompanied by substernal retraction. The right border of the heart was displaced to the left, and the left border and apex were hard to define. The heart was rapid, the sounds somewhat muffled, but there were no murmurs. The left side of the chest was resonant, except at the base posteriorly, where there was slight impairment. Many sub-crepitant râles were heard in this area. The larynx was free. Roentgenological examination revealed a large air-sac filling the entire right side of the thorax and displacement of the mediastinum to the left. A trocar was inserted through the 4th interspace in the right axilla and air escaped under pressure. Subsequent tapping at the same spot gave 25 c.c. of greenish yellow pus. The child eventually died. Autopsy showed a large cyst occupying the whole of the right upper lobe of the lung. It was apparently of bronchogenic origin. The condition cannot be differentiated from pneumothorax without the use of the x-ray.

JOHN NICHOLLS

Ophthalmology

Buphthalmus in Identical Twins. Kiehle, F. A. and Pugmire, C., *Arch. Ophth.*, 1934, **12**: 751.

The patients were identical twins, aged six. At three months of age the right eye of one and the left eye of the other began to enlarge. This proceeded until the time of operation at the age of six. There was no history of any one else in the family with eye defects. One twin had in the affected eye a vision of 10/100 and a tension of 65 mm. (McLean), a deep excavation of the nerve head, and several ruptures in Descemet's membrane. An Elliott trephination was performed and he made a good recovery. After 6 months the tension was still normal in the affected eye. The other brother had a more severe case, there being no light perception whatever in his eye, and the tension was 75 mm. The cornea was hazy, the iris muddy, and the condition of the nerve head could not be ascertained because of the clouding of the cornea. In this instance the eye was enucleated.

MADGE THURLOW MACKLIN

Plasmocytoma of the Conjunctiva. Tajkef, L., *Ann. d'Ocul.*, 1934, **171**: 934.

Plasmocytoma of the conjunctiva is a clinical rarity, and is still a subject of considerable controversy, both from the etiological and

pathological viewpoint. The case here reported was of Mrs. J.F., aged 60 years, who up to 1925 enjoyed good health, until an abscess of the left lower lid appeared. With the application of poultices the abscess discharged and seemed to be cured, but recurred within a few months at the same place. She was treated during the year 1926 and in the month of September, 1927, came under the observation of Tajkef. At that time the whole of the left lower lid was swollen, everted, with a fungus-like yellowish material filling the cul-de-sac and extending on the bulbar conjunctiva. The superior palpable conjunctiva, too, was thickened, inflamed, and granular. The cornea and lens were transparent, and movement of the globe was free. Medical treatment was without effect, so the patient was admitted to hospital and a biopsy done. The histological details of examination are given. Diagnosis: infiltration of the conjunctiva by lymphoid and plasma cellular tissue.

S. HANFORD MCKEE

The Employment of Ablation of the Sac, of Stricturotomy and of Dacryocystorhinostomy in the Affections of the Lachrymal Passages. Bastan, N., *Ann. d'Ocul.*, 1934, **171**: 846.

In a patient presenting an atresia of the lachrymal sac, simple or complicated by dacryocystitis, pericystitis, etc., there is an important fact to consider, namely, whether the seat of the constriction is above or below the sac. In the first case we proceed to remove the sac; in the second, stricturotomy is the procedure of choice, and it is only when at a loss what to do that recourse should be made to plastic dacryocystotomy. If the last is chosen, removal of the sac is necessary. It is to be noted that in the majority of cases where stricturotomy is chosen, if the cause is shown to be a bony lesion only, the chances are that the tissues will be found to be considerably altered, and the success of a plastic dacryocystorhinostomy will be to some extent hindered. In such a case it is better to proceed with removal of the sac.

S. HANFORD MCKEE

Granuloma of the Bulbar Conjunctiva with Adenopathy. Vialeix, V., *Ann. d'Ocul.*, 1934, **171**: 807.

Recent communications by Morax have drawn attention to lesions of the conjunctiva of the granuloma type, accompanied by large adenopathy. The author adds two observations which occurred almost simultaneously.

The following symptoms constitute a clinical syndrome which he believes is characteristic:—(1) a lesion of the limbus of the conjunctiva, of nodular or granuloma type, associated with acute conjunctival symptoms, and accompanied by yellowish granulations of the inferior cul-de-sac, in one case, and by a common follicular appearance, in the other; (2) a large sub-maxillary and pre-auricular adenopathy. S. HANFORD MCKEE

Urology

The Etiology of Stone. Joly, J. S., *J. Urol.*, 1934, **32**: 541.

The earliest calculus known was discovered in 1901 in the grave of a boy about 16 years of age at El Amarah. This cemetery contained the remains of a race who flourished before the first historical king of Egypt. Analysis of the stone showed it to resemble the uric acid calculi with which we are familiar today, despite the fact that it was at least 7,000 years old. The frequent occurrence of vesical calculus in childhood has been the subject of comment right through medical history. Celsus would only operate on boys and indeed could not on well developed adults, as the stone was located with one finger in the rectum and one on the abdomen and then shoved down on the perineum, and an incision was made directly on it. This operation was employed for the first 1,500 years of the Christian era.

Throughout the 16th, 17th and 18th centuries vesical calculus was very common, and well known men suffered from it, among them, Pepys, Sydenham, and Walpole. The latter took Joanna Stevens' quack remedy and declared himself cured, but post-mortem revealed two vesical calculi. This remedy had such a vogue that it was purchased by the State in 1739 for 5,000 pounds. It contained powder of old tobacco pipes, egg shells, snail shells, soap, white onion, saxifrage, burdock seeds, hips and haws and a few other vegetable extracts. In the latter half of the 19th century a decided change in the age-incidence becomes apparent. The frequency diminishes in childhood, but remains unchanged in adult life. This change applies to England, France and America, but not to India and China, and is admittedly due to improved standards of living which obtain only in the former countries.

It has long been known that stone was common in certain districts and rare in others, and this has led to the supposition that the soil, water or climate might be factors, but a study of the stone areas shows that they have entirely different geographical formations and climatic conditions. There is really very little evidence to show that hard water has any appreciable effect on stone formation. In the Canton district, where stone is common, the water is soft, and in addition the Chinese always drink tea so that any hardness would be removed. The water in Holland is also soft and stone is very common. On the other hand the water in Switzerland is very hard, yet stone is rare. A study of climate also throws little light upon the causation of stone.

One fact, however, emerges from the geographical survey of lithiasis, and that is, that it is rare in areas where dairy farming is extensively carried out and where the inhabitants can enjoy a mixed diet, and it is common where cereals form the staple food.

The question of diet is not entirely a simple one either, and the formation of stone does not depend simply on an excess of a given stone-forming substance — the best examples of this being the large percentage of uric acid calculi found in some of the stone-forming areas of India where the diet is entirely vegetarian. Most of these stones also contain varying amounts of oxalates, despite the fact that rice and dry meal contain only traces. The uric acid in these cases must be formed as a result of metabolism of tissue cells and the oxalates largely from fermentation of carbohydrates in the intestinal tract. On the contrary, the experience of McCarrison and others tends to show that stone is to a certain extent a deficiency disease and can regularly be produced in rats by a diet deficient in vitamin A. A study of the diets of the inhabitants of the noted stone-forming areas shows them to be particularly lacking in this vitamin. In those countries where living conditions have improved and where fresh dairy products have become generally accessible stone-forming centres have disappeared.

Adults who are put in bed with fractures, and children with tuberculous bone disease are notoriously subject to stone. Immobilization of the skeleton and injury or disease of bone causes a decalcification, the calcium being largely excreted by the kidneys. This readily combines with phosphates and tends to be deposited in the urinary passages. A similar process occurs in diseases such as parathyroidism and osteitis fibrosa. In diseases of the urinary tract the influence of obstructive factors and of infection are discussed in detail.

In conclusion the writer reviews the manner in which the stone-forming salts are held in supersaturated solution by absorption to the surface of colloidal molecules. It is pointed out that colloidal suspensions are unstable, that the colloids may not always remain in a fine state of subdivision, that they may coalesce, their surface area becomes greatly reduced and salts thus precipitate. Similarly, variations in the quantity or nature of the colloids will produce the same result. The colloid is derived from the renal epithelium, and since it is well known the vitamin A deficiency produces changes in the lining of the urinary passages, may it not also have some effect on renal epithelium? It is the writer's belief that the deficiency hypothesis is the most plausible, and explains the principal features of the disease as we know it today and also the change in incidence during past years.

N. E. BERRY

Neurology and Psychiatry

Graduated Jugular Compression in the Lumbar Manometric Test for Spinal Subarachnoid Block. Grant, W. T. and Cone, W. V., *Arch. Neurol. & Psych.*, 1934, **32.**

The pressure readings in the cerebral spinal fluid, as registered on the Ayer manometer, have now been accepted as a most important part of the investigation of the lesions of the central nervous system. More particularly is this true of those cases where there is a suspected block of the subarachnoid space. The customary method of digital compression of the jugular veins presents certain difficulties of interpretation in cases of partial obstruction. Various methods of rendering this valuable test more definite and more accurate have been attempted, such as Elsberg and Hare's amyl nitrite method, but all are very far from perfection.

The procedure suggested in this article is simplicity itself. Placing an ordinary blood pressure cup about the patient's neck, pressure is gradually increased and the manometer readings recorded at varying levels. In this manner, a meticulously exact examination can be carried out. Such a method has certain obvious advantages: (1) it gives a graduated jugular compression which can be exactly duplicated in the same patient; (2) it makes possible a standard which can be used from patient to patient; (3) the results obtained by different observers are in much closer agreement, and are therefore more dependable.

G. N. PATERSON-SMYTH

Tumours of the Brain in Infancy. Gross, S. W., *Am. J. Dis. Child.*, 1934, **48**: 739.

The difference between the intracranial changes produced by an expanding lesion in infancy and those produced in later life is due to the elasticity of the cranial bones in infancy which permits spontaneous decompression to occur as the lesion increases in size. Nine cases of tumour of the brain in infancy are reported. The study was limited to neoplasms primary in the brain or its coverings—tuberculomas and syphilomas being excluded. Hydrocephalus was present in every case in the series. Rapid enlargement of the head was observed by the parents in 7 cases. Vomiting was present in 7 cases, and often misled the attending physicians into directing their attention to the gastro-intestinal tract. Choked discs were present in 5; in 3 there was no elevation of the discs, but the retinal veins were engorged. The mid-cerebellar region is the site of election of tumours of the brain in infancy, and was the location in 7 of the 9 cases reported here. In the differential diagnosis hydrocephalus due to causes other than tumour of the brain must be

considered, notably, obstruction of the aqueduct, the result of either an inflammatory process or a congenital defect, communicating hydrocephalus, subdural hæmatoma, and abscess of the brain. Hydrocephalus due to an inflammatory or congenital block can usually be excluded by a ventriculogram. Subdural hæmatomas usually occur in poorly nourished or rachitic infants. Bulging of the fontanelles, which is an early sign in tumours of the brain, appears late in subdural hæmatoma. Lumbar puncture and ventricular puncture may yield a clear fluid, but a needle introduced into the subdural space through the fontanelle gives bloody or xanthochromic fluid. Abscesses of the brain are very rare in infancy. The history of discharging ear or a septic focus elsewhere in the body should suggest the possibility of brain abscess in an infant with an expanding lesion of the head.

FRANK A. TURNBULL

Therapeutics

Treatment for Primary Myopathies. Reese, H. H., Burns, E. M. and Rice, C. M., *Arch. Neurol. & Psych.*, 1935, **33**: 1.

The whole question of the myopathies is in a grievous state of confusion. The present authors state that all primary myopathies show disturbances in the creatine metabolism, and, basing themselves on this conception, discuss the value of glycine in these conditions. The normal person retains small amounts of creatine, but in the myopathic patient the entire amount of creatine is excreted unchanged. Metabolic studies suggest that the energy for muscular contraction is derived from the breaking down of the labile substance phosphagen into its components creatine and a phosphate. After contraction lactic acid accumulates, derived from the breakdown of glycogen. In the presence of oxygen and lactic acid phosphagen is resynthesized. The source of the creatine is not certain, but it is most probably from the amino-acids. On rather flimsy evidence the theory is advanced that the formation of creatine is, in part at least, dependent on the storage of glycine, and it appears likely that in the dystrophic glycine is present in some non-assimilable form.

The authors discuss a series of 8 cases of muscular dystrophy and myasthenia gravis in which glycine or glutamic acid was given. Investigation of the urine showed at first a rise in the creatine output, followed by a fall back to the normal level. This was accompanied by a considerable symptomatic improvement in the myasthenic cases, but the change in the true dystrophies was dubious. The conclusion reached is that treatment with glycine is the most encouraging procedure yet evolved for the treatment of the myopathies. Cures are not obtained, but definite remissions, clinical and metabolic, are brought about.

G. N. PATERSON-SMYTH

Pathology and Experimental Medicine

Latent Tuberculous Immune Bodies in Non-tuberculous Individuals. Baker, A. B. and and Wetherby, M., *J. Infect. Dis.*, 1935, **56**: 153.

The blood of 100 consecutive adult patients with chronic arthritis was examined with the complement-fixation test for tuberculosis, both before and after a course of intravenous vaccination with streptococci. Fifty-one gave a positive skin test with Old Tuberculin and a negative complement-fixation test before the institution of any treatment; of these 26, or 51 per cent, reacted positively to the complement-fixation test (for tuberculosis) after intravenous streptococcic vaccination. This would indicate that specific tuberculous antibodies may be discharged into the circulation of patients who at some previous time had had tuberculous infection, as indicated by a positive skin test. If antibodies indicate, in any way, resistance against tuberculosis the authors' results would suggest a persistent protection long after the original infection. Forty of the total hundred patients showed a negative Mantoux' test and a persistently negative complement-fixation test for specific tuberculous antibodies after intravenous streptococcic vaccination. The occasional positive complement fixation for tuberculosis in apparently normal persons may be explained in some instances on the basis of a non-specific liberation of antibodies produced during a previous tuberculous infection.

JOHN NICHOLLS

DIPHTHERIA OF THE PENIS.—M. P. Borovsky states that only 4 cases of diphtheria of the penis occurring under 1 year of age have been reported in the literature. He believes that the patient he observed is the youngest one on record, 3 weeks. Information concerning two other authentic cases, one in the new-born period and one at 6 weeks of age, was received by personal communication. Two other cases are recalled by the Chicago health department authorities. In all 5 cases (three absolutely authentic, two reported from memory by Chicago health department authorities), circumcision was done by the same mohel. The author believes that transmission of the diphtheritic infection probably took place in his case during the change of dressings at home two days after the circumcision. The mask and rubber gloves worn during the operation would probably prevent the infection at that time.—*J. Am. M. Ass.*, 1935, **104:** 1399.

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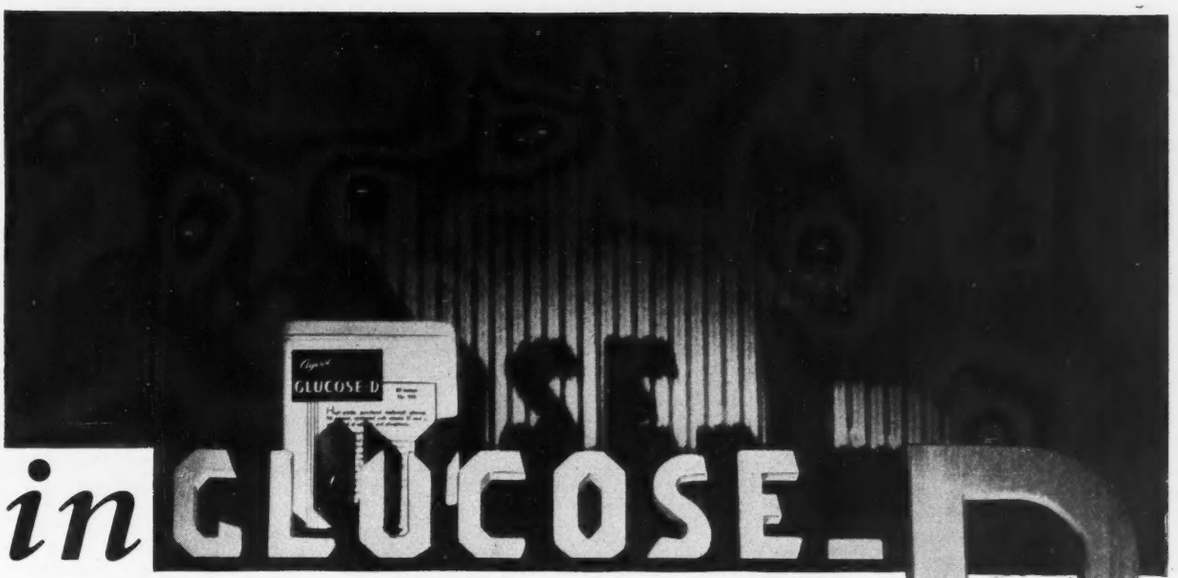

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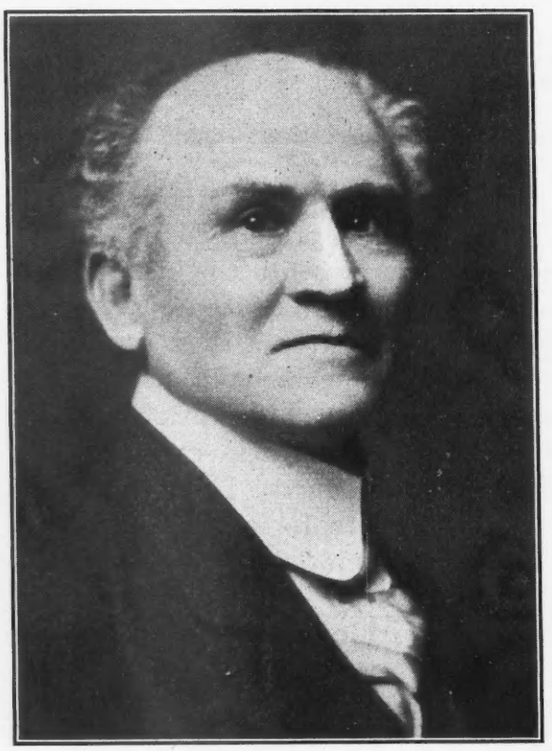
Obituaries

Dr. Abraham Groves, of Fergus, Ont., died on May 12, 1935, at his home, from pneumonia. He was eighty-seven years old. A pioneer in surgery, he had been a picturesque figure in the medical profession for sixty-five years.

Dr. Groves was born near Peterborough, coming with his parents to West Garafraxa when four years of age. He attended school in Fergus, and graduated in Medicine from the University of Toronto in 1871. In 1874 he was married to Jennie Gibbons, who died twelve years later. In 1911 he married Ethel Burke, daughter of Mr. and Mrs. D. S. Burke, by whom he is survived. He was a life-member of the Order of Foresters, Independent Order of Oddfellows, and of the Masonic Order and was a member of St. James' Anglican Church. For fifty-three years he was physician at the Wellington County Old People's Home.

Besides his wife, he is survived by one son, Dr. William A. Groves, of Fergus; a daughter, Mrs. R. A. Hiltz, of Toronto; three sisters, Mrs. John Nesbitt, Fergus; Mrs. Thomas Nesbitt, Lachine, Que.; Mrs. R. W. Bright, Wiarton; and one brother, Gibson Groves, of Parry Sound.



Abraham Groves

Fame, if not exactly fortune, was almost from the beginning, the lot of this slender, keen-eyed Abraham Groves. Nowhere was that fame so much appreciated as in Fergus where 65 years ago, following graduation, he hung up his "shingle" and injected his scholarly, yet dynamic, force into the life of the community. Naturally, the early days of his practice were associated with the long drives, heavy night work, and sleepless vigils, common to the career of any family physician of the back concessions. But it was not long before this man was questing for new cures and new remedies, was pushing back the mystery that for so long had enshrouded certain human ailments of a particularly baffling nature. Thirteen years after he had opened his Fergus practice, he performed the appendicectomy that was to earn for him the recognition that ever afterwards he was to win handily. Three years ago, when he chose to present to this little Wellington County village the hospital which he had founded in 1902, and men from every walk of life gathered from far and near to pay tribute, Dr. A. L. Lockwood, chief of the Lockwood Clinic of Toronto, ably expressed universal opinion of the man in the claim that "not a man in our profession today deserves greater praise".

From his boyhood days Groves "set out" to become a doctor. At the Toronto Medical School which he attended, he distinguished himself in his studies. Distinction marked all subsequent efforts and has in a marked measure been handed down to his son, Dr. W. A. Groves, who is now left to carry on, single-handed, the notable team surgery that father and son practised in Fergus before failing eyesight ended for the parent the long and successful trail of achievement.

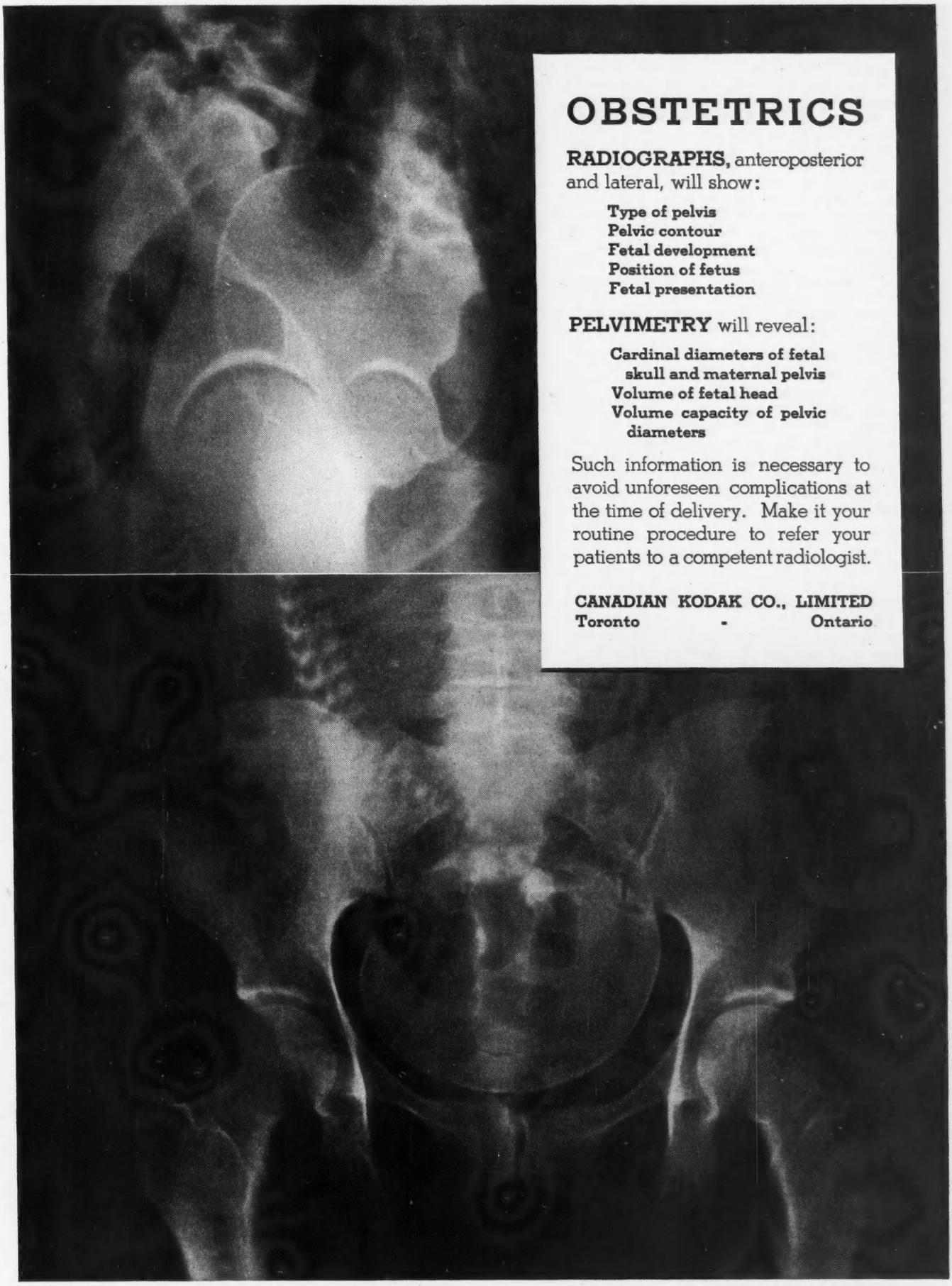
Today, Fergus people of three score years and ten recall how the "Old Doctor" when first they knew him tended their boyhood hurts—how he walked and drove through blizzards and over almost impassable roads to the homes of the sick and suffering—how first there crept about the countryside mysterious rumours of this "new business" called surgery.

Dr. Groves' early operative work was done under very primitive conditions. The operating room was generally the kitchen with a couple of boards on trestles, or a kitchen table, as operating table. Milk cans were used as basins, and sea sponges for wiping. If the operation had to be done at night, a coal-oil lamp supplied the light. Chloroform was the one anæsthetic.

Few, if any, realized at this time how eminent a surgeon this young country doctor was to become. In 1879, on the usual kitchen table, in the Bullfrog Tavern in Guelph, he operated on a man and removed six stones from the bladder through the abdominal route. This was the first time such an operation had been attempted. In 1874 he had the extraordinary foresight to boil everything that was to be used in his operations. He scrubbed his hands and arms for 30 minutes with soap and boiled water, and from the very outset demonstrated that peritonitis and infected wounds could be avoided by such tactics. Many years before surgical gloves were invented he boiled ordinary rubber driving gloves and convinced himself they prevented the spread of infection from one patient to another.

Then in May, 1883, while antiseptic surgery was but little attempted, and the discoveries of Lord Lister in this line were being attacked by the leaders of the profession in Europe, Dr. Groves undertook a feat which proved him to be a pioneer and a surgeon of resource. One of his patients became seized with agonizing pains. Dr. Groves diagnosed the case as appendicitis, and decided to operate. In his little surgery he prepared his crude instruments, a razor, a small edged knife, a home-made scalpel, and his harsh anæsthetic. Then he did the most amazing things. Besides washing his hands and arms, he scorched his instruments in flame. The operation was performed. The appendix came out. The patient lived. This is believed to be the first appendicectomy in history.

Dr. Groves was formerly medical superintendent of the Royal Alexandra Hospital, now renamed the Groves Memorial Hospital in his honour. He built this institution in 1902 and in 1932 deeded it as a gift to the village of Fergus. He was a life-member of the Ontario Medical Association. A grandson, Sutherland Groves,



OBSTETRICS

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Fetal development
Position of fetus
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graduated from the University of Toronto in medicine, to complete the third generation of doctors in the Groves family.

Not only was Dr. Groves a surgical genius but also a philosopher, as displayed in a book, "All in the Day's Work," written by him shortly before his death. Few have done more for Fergus than Dr. Groves, who served on practically every municipal board. In his early days he operated a flour mill, later adding an electric light plant to supply power, not only for his own mill but for the villages of both Fergus and Elora. This was later purchased by the Ontario Hydro-Electric Commission.

One of the greatest disappointments in the grand old doctor's life was the removal of the training school three years ago from the hospital he had founded and from which institution 147 nurses graduated, many of whom occupy prominent positions today.

Dr. Georges Bique, of Ste. Anne de la Perade, Que., died at Three Rivers on June 2, 1935, from pneumonia. He was fifty-eight years of age, and was educated at the Quebec Seminary and the University of Montreal (M.D., 1903). He practised in Abitibi until five years ago, when he returned to St. Anne.

His widow, formerly Miss Diane Roberge, and nine children survive.

Dr. Charles William Marlatt, of St. Thomas, Ont., died on May 31, 1935, aged eighty-nine. A native of Yarmouth Township, Dr. Marlatt was a graduate of Trinity Medical College, Toronto (1872). He also held the M.R.C.S. of England (1872). Dr. Marlatt started practising in St. Thomas in 1873 and then moved to Alvinston, where he lived for eight years. In 1882 he moved to Aylmer and practised there until his retirement in 1908, when he removed to St. Thomas.

Dr. Fabian Blanchard, of Lindsay, Ont., died on May 4, 1935. He was born in 1870 and a graduate of the University of Toronto (1893). He is survived by his widow, formerly Miss Marion Benson.

Dr. Edmond James Boardman. While visiting his daughter in Saskatoon, Dr. E. J. Boardman, a prominent urologist of Winnipeg, died suddenly of coronary thrombosis on May 12th. Born at Shediac, N.B., in 1878, he came to Winnipeg with his parents in 1881, was educated in the public schools and at St. John's College, and graduated in medicine from Manitoba Medical College in 1907. After engaging in general practice he devoted himself from 1918 onward to urology and in 1928 was appointed Assistant Professor of Clinical Surgery (Urology) in the Faculty of Medicine. He was urologist at St. Boniface Hospital.

In 1928 Doctor Boardman was elected President of the Manitoba Medical Association, and in this capacity he rendered valuable service to organized medicine. He was Chairman of the Auditorium Committee in connection with the British Medical Association at Winnipeg in 1930, and Honorary Secretary of a joint committee of the Manitoba Medical Association and the College of Physicians and Surgeons of Manitoba to consider the matter of Public Medical Services. Masonry attracted him strongly and he received many honours from the Craft, the chief being his election to the office of District Deputy Grand-Master.

He is survived by his widow, one son and two daughters. An able speaker, a sound clinician and a good teacher, Dr. Boardman will be greatly missed in medical circles.

Dr. Albert J. Fisher, of Toronto, died on May 16, 1935, in his seventy-seventh year. Retiring two years ago after being suddenly stricken while travelling, he had been in failing health since.

Doctor Fisher was born in Wellington County, and was a graduate of Queen's University (1887). He practised at Brigden and New Liskeard and in 1915 joined the Canadian Army Medical Corps. He was a coroner for the district of Nipissing; M.O.H. for New Liskeard; and surgeon for the Canadian National and T.N.O. Railways; a member of the British and Canadian Medical Associations; and a Fellow of the Royal Institute of Public Health. During the war he was in charge of Queen's Canadian Hospital, Beachboro Park, England, and in charge of surgery at Moore Barracks Hospital.

He is survived by three sisters, Mrs. D. M. Fisher, Mrs. J. P. Street, of Toronto, and Mrs. W. J. Leach.

Dr. Arthur Clifford Johnston, of Wyoming, Ont., died on May 9, 1935, as a result of injuries received by being knocked down by a taxi-cab. He was fifty years of age, a graduate of Queen's University (1907).

Dr. John Alexander Jones, of Ottawa, died on May 15, 1935, in his eighty-first year. He formerly resided at Kemptville and Kingston. He was a graduate of Queen's University (1874).

Dr. Andrew Goetz Ludwig, of St. Catharines, Ont., died on May 25, 1935, in his sixty-third year. He was a graduate of the Medical Faculty of Trinity University (1897).

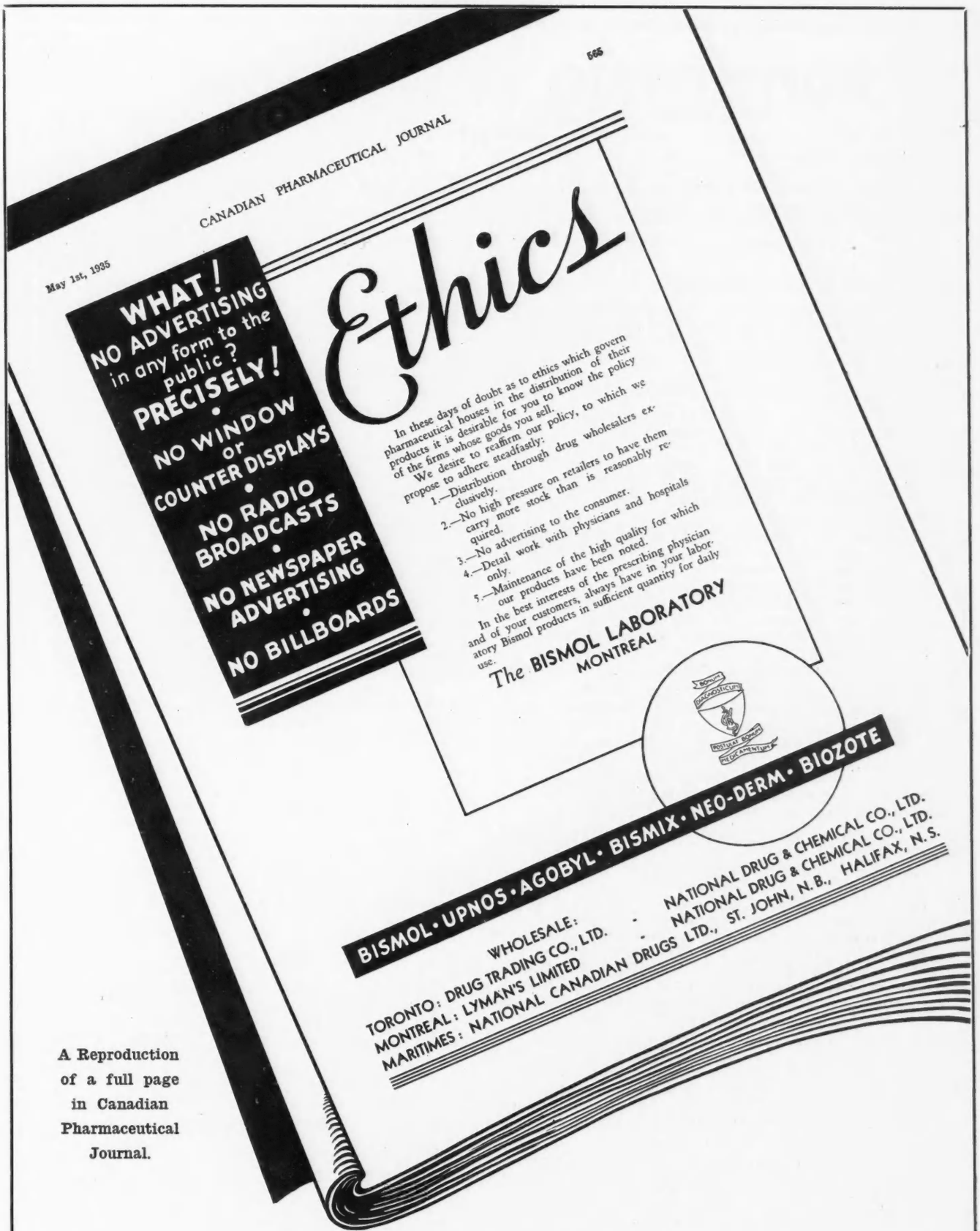
Dr. J. T. McGibbon, of Saskatoon, Professor of Anatomy in the University of Saskatchewan, died unexpectedly, on May 14, 1935, aged thirty-seven years.

Doctor McGibbon came to the University of Saskatchewan when the medical school was founded about eight years ago.

Dr. Walter C. Murray, president of the University, describes Doctor McGibbon as one of the ablest teachers of anatomy in Canada. A graduate of the University of Glasgow, on coming to Canada some years ago he was appointed Assistant Professor of Anatomy at Manitoba University, under Professor J. B. Grant, who is now at the University of Toronto.

He leaves, beside Mrs. McGibbon, a son, Robin, aged two, and relatives in Glasgow.

Hon. Dr. Frederick Laurence Schaffner, member of the Canadian Senate for Manitoba since 1917, died on May 22nd at his home in Winnipeg. He was born in 1855 at Williamstown, N.S., and was descended from one of the German colonists who had settled in Nova Scotia in 1750. He received his B.A. degree from Acadia College and his M.D. from Toronto University. He spent two years in post-graduate work in Chicago and New York. After practising for a few years in the East he came to Manitoba in the early 90's and located at Boissevain, where he soon acquired a successful practice and took an active part in public affairs. In 1904 he was elected member of the newly created constituency of Souris, and was re-elected in 1908 and 1911. He served during the war and was Chief Sanitary Officer for Camp Hughes, with the rank of Captain. In 1917 he became D.A.Q.M.G. for Military District No. 10. He was appointed to the Senate on October 23, 1917. In 1926 he was the Canadian delegate to the British Empire Parliamentary Association which made a tour of Australia. He is survived by his widow. Dr. Schaffner took a keen interest in the Manitoba Sanatorium at Ninette.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May 1st, 1935
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News Items

Great Britain

Sir Frederick G. Banting, leader in the research which led to the discovery of insulin at Toronto, was presented on June 4th with the Gold Medal of the Society of Apothecaries of London. He was hailed by Sir William Wilcox as "one of the most distinguished research workers in the world."

Alberta

The following Acts or Bills have been amended at the recent session of the Provincial Legislature:—

The Health Insurance Bill provides that Improvement Districts may come in as well as Municipalities, and that the Minister of Municipal Affairs may act in lieu of a Council, as they have none in Improvement Districts.

Clause No. 43 is interesting; it may not be harmful, seeing that the Act provides that one of the Commissioners shall be a medical practitioner. It reads as follows:—

"In case any surgical treatment is given by a medical practitioner to any resident patient which appears to the Commission to be unnecessary, the Commission may refer the matter to the Professional Board of Reference, or proceed to enquire into the circumstances, and if the Commission is satisfied by that enquiry that the treatment was unnecessary shall so certify, and thereupon the medical practitioner shall not be entitled to any payment in respect of it, from the Commission."

Clause 51 reads:— "This Act shall come into force upon a date to be fixed by proclamation of the Lieutenant-Governor in Council."

By the Marriage Act each party to the contract must present an affidavit setting out that the party making the affidavit is not then infected with any venereal disease or with tuberculosis. There does not appear to be any provision that a certificate from a medical practitioner is necessary.

The Chiropractic Act, which was intended to make the qualifications lower and to have a purely Chiropractic Board of Examiners, was withdrawn.

The Societies Act provides that:— "Subject to the other provisions of this section, a Society may by by-law make provision for affording to its members and relatives of its members, sick, accident and funeral benefits." The by-law has to be approved by the Superintendent of Insurance, and "The rate of payment for sick, accident and funeral benefits, or any of them, shall in no case be less than the rates prescribed for the time being in the by-law in respect thereof."

A new amendment to the Town and Village Act permits a town or village to make a contract for medical care and attention to residents, either alone or with another town, city, village or municipality; such must be carried by a two-thirds majority of property owners and be sanctioned by the Minister of Health.

Stability of Agricultural Industry:— Clause 3 provides that "Every resident farmer shall at all times during which this Act is in force be entitled to retain against every execution, creditor and every person claiming for rent, payment under any lease or any other tenancy, howsoever created, which is made or created for the purpose of securing or enforcing payment of any money payable under any mortgage or agreement for sale of the land, in respect of which the rent is payable and whether the rent is payable in money or in kind, or in any other way.

(*a*) an amount either in money or marketable produce, sufficient to provide the farmer and his family with all necessary food, clothing, medical and hospital services, and other necessaries of life for the next ensuing twelve months."

It will be noted therefore that the medical accounts are classed as preferred claims with food, clothing, etc.

G. E. LEARMONTH

British Columbia

The medical board of the Vancouver General Hospital has established a Tumour Clinic, whose members have been selected from the attending staff. Every case of neoplasm from the public wards or out-patient department is referred to this Clinic, where the diagnosis is reviewed and the type of treatment to be employed is decided. The recommendations of the Tumour Clinic are recognized as mandatory.

A news item appearing recently in one of the Vancouver papers indicates a most encouraging and commendable spirit of self-reliance and recognition of modern health problems in some of the more remote and isolated parts of the province. It is learned that the Women's Institutes of Peace River and Bulkley Valley are carrying out their dental and vaccination services for the children aided by funds raised by "pie-socials", whist drives, dances, etc., during the winter months. Other services being arranged for by this means include nursing classes, medical inspection of school children, distribution of pamphlets on "Care of Babies," testing cows for tuberculosis, and providing iodine for school children.

The appointment of Dr. W. H. Hatfield as Director of Tuberculosis Services for the province has been announced by Hon. Dr. Weir, Provincial Secretary and Minister of Health. Dr. Hatfield, who has been Director of the Public Health Institute for Diseases of the Chest for some time, is a keen and active student of tuberculosis in all its aspects and relations, and recently returned from abroad where he was engaged in a survey of modern methods of dealing with this public health problem as exemplified in Europe.

D. E. H. CLEVELAND

Manitoba

Professor J. B. Collip, of Montreal, was the guest of honour at a luncheon given by the Scientific Club of Winnipeg on May 14th prior to his receiving an honorary degree from the University of Manitoba.

ROSS MITCHELL

New Brunswick

Dr. W. H. Laughlin, 69 years of age, died on May 25th. He had just returned from making a call on a patient and was seized with a sudden fatal heart attack. Dr. Laughlin was born in St. Stephen on June 27, 1865, and graduated in medicine from the Medical Department of Union University, New York City, and McGill University, Montreal. Dr. Laughlin has had a long association with the militia; went overseas in 1916, serving in England, France and Belgium. He had been mayor of Milltown for fifteen years, a member of the Masonic Order and the Royal Arch Chapter, as well as the Mystic

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Shrine. At the time of his death he was Chairman of the Milltown School Board.

Dr. Allan Stirling, Fredericton, died on May 27th at his home following a sudden heart attack. He was born at Maugerville, educated in the Fredericton High School and McGill University. He practised at Stanley until the World War when he went overseas with the 132nd battalion. For several years Dr. Stirling had been Secretary of the Fredericton Medical Society.

The annual meeting of the Saint John Medical Society took the form of a dinner meeting at the Byng Boys Club, with Dr. J. P. McInerney in the chair. No special program of speeches was arranged for, but the gathering was pleased to hear Dr. W. W. White, one of the older members, recite several selections of poetry. The election of officers for the year 1935-6 resulted as follows: *Chairman*, Dr. W. J. Baxter; *Vice-Chairman*, Dr. Fred. Jennings; *Secretary*, Dr. C. O. McKay; *Treasurer*, Dr. G. B. Peat.

Dr. F. D. Weldon, a graduate of Maryland Medical School, 1912, died at Grand Harbor, Grand Manan, on May 21st.

Dr. Robert Baird has recently returned from post-graduate work in England and has taken up practice at Cambridge, N.B.

Dr. V. D. Davidson, of Saint John, has been appointed aide-de-camp to His Honour the Lieutenant-Governor of the Province of New Brunswick.

Dr. George F. Skinner, F.R.C.S., F.A.C.S., of Saint John, was chosen as guest speaker at the annual alumni banquet of Mount Allison University.

Encouraging reports have recently been received concerning the convalescence of Dr. W. E. Rowley of Saint John, who is still sojourning in the South.

A. S. KIRKLAND

Nova Scotia

A Conference at Glace Bay to discuss the tuberculosis situation was held on May 21st. At this meeting Dr. F. R. Davis, Provincial Minister of Health was present. The meeting was largely due to the efforts of the Canadian Legion on whose behalf Dr. Fabian Bates presented a brief. Considerable difference of opinion was expressed as to the best method of combating tuberculosis. Whether annexes to hospitals or a central institution would be more suitable was not decided upon. A serious difficulty recognized by all present was the question of funds.

Dr. H. W. Schwartz became the new President of the Halifax Branch of the Medical Society of Nova Scotia on April 24th. At this meeting a portrait in oils of the late Dr. Murdoch Chisholm was presented by his son Kenneth to the Society. A Committee was formed to determine a suitable place for hanging the portrait in the Victoria General Hospital.

The semi-annual refresher course for nurses sponsored by the Provincial Department of Health concluded recently. Several physicians gave lectures. The topics selected included a wide range and were chosen with the special view to the problems encountered by nurses in the practice of their profession.

Dr. Harry S. Morton, son of Dr. C. S. Morton, 52 Spring Garden Road, Halifax, has been elected a fellow of the Royal College of Surgeons of England. This is the most coveted and highest qualification in surgery in the Empire, and is awarded only after a most searching and exhaustive examination.

Dr. Morton is a graduate in Arts of Dalhousie University and received his Master's Degree in Science for post-graduate work in Physiology and Biochemistry under Professors Babkin and Young. He then proceeded to England and entered the London Hospital Medical School, taking in course his primary F.R.C.S. and his clinical work leading to the M.R.C.S. (Eng.) and L.R.C.P.(Lond.). One year later he was successful in obtaining his M.B., B.S. from London University.

Since qualifying he has been an intern in the London Hospital attached to the medical, pathological, gynæcological and surgical services. The past three years have been devoted entirely to general surgery which branch he proposes to follow.

N. B. DREYER

Ontario

The work on the construction of the Women's College Hospital is nearing completion, and it is hoped that the building will be ready for occupation about September 1st. A drive is being made at present to provide $100,000 for furnishings.

Sir Frederick Banting is at present in England where he was called to receive the Fellowship of the Royal Society and the medal of the Apothecaries' Society.

At the annual meeting of the Toronto East Medical Association, Dr. E. A. McDonald, a past-president of that Association, was presented by his colleagues with a portrait in oils.

The Royal College of Physicians of London, England, has awarded a Leverhulme scholarship to Dr. Robert L. Noble, of Toronto, who has been engaged in research work during the past year in the Courtland Institute of Biochemistry, Middlesex Hospital.

On May 27th, the Honourable Dr. J. A. Faulkner, Minister of Health for Ontario, opened the new Sanatorium in the City of Fort William. About fifty-five of its one hundred beds are already occupied.

J. H. ELLIOTT

Quebec

Judgment was rendered recently by Mr. Justice Laliberté, at Montreal, dismissing the action taken by W. T. Payne to annul a codicil to the will of the late Blanche Eloise, wife of Frank L. Hutchinson.

The codicil changed the will, so that a considerable portion of her property, estimated at $150,000, was given to McGill University for the establishment of the Blanche Hutchinson Research Fund, to be administered by the deans of the faculty. It also left a small sum of money and some movable property to Miss Isobel McCaw, who had been Mrs. Hutchinson's companion and domestic manager for some years.

The action had alleged that Mrs. Hutchinson, suffering from a cerebral tumour, had been in unfit mental condition at the time of making this codicil, and that Miss McCaw had exercised an undue influence over her, to an extent that amounted to fraudulent means.

In rendering judgment, His Lordship says, in part: "Considering that the evidence of the defence is preponderant as to the sanity of testatrix and her

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capacity to make a will, and the evidence as to undue and fraudulent influence is nil or quite insufficient;

"Considering that this court believes the evidence of the defence preponderant as to the capacity to make a will, not only by reason of the totality of the non-medical evidence, but also that of the medical experts who were heard on both sides; that medical witnesses were called who were in constant touch with testatrix during all or a great part of her illness, and some of them at the time when she made the codicil attached, or soon afterwards; that they were able to observe personally and frequently the testatrix during the several months before the signing of the codicil and there is reason to believe that those who followed the illness of the testatrix almost constantly and visited her frequently are better in a position to judge of her mental condition than those whose conclusions are hypothetical and theoretical.

"Considering that testatrix in 1931 told one of her friends that she had made a will and entrusted her pets to Miss McCaw and given a legacy to McGill, it results that testatrix understood the contents of the codicil and had the mental competence.

"Considering that the changes made are the more reasonable in that, between the time of making the will and the time of the codicil, her mother had died leaving $1,000,000 to petitioner and a like sum to testatrix.

"And finally, considering that petitioner was due to receive one-third of his father's estate of about $4,000,000 on testatrix' death, and had already received one-third thereof at his father's death, and was owner of interests in numerous companies and businesses, the court concludes that it was reasonable for Mrs. Hutchinson to think him wealthy enough not to need anything from her, and it was therefore reasonable for her to leave the residue of her estate to McGill, the court therefore dismisses the action, with costs against petitioner, in respect of both counts."

It is announced that at a Comitia of the Royal College of Physicians of London, held in April, Prof. Jonathan C. Meakins, of McGill University and the Royal Victoria Hospital, Montreal, was elected a Fellow.

At the Convocation of the University of Montreal, held on May 29th, last, Mrs. Katharine M. Bonham Bridges, Assistant Professor of Abnormal Psychology in McGill University, received the Doctorate of the Faculty of Philosophy, with honours.

The American Neurological Association convened at the Mount Royal Hotel, Montreal, on June 3rd, under the presidency of Prof. Colin K. Russel, Clinical Professor of Neurology at McGill University and Neurologist of the Montreal Neurological Institute.

Dr. J. B. Collip, F.R.S., Professor of Biochemistry at McGill University was granted an Honorary LL.D. by his Alma Mater, the University of Manitoba, at the recent Convocation in Winnipeg.

Saskatchewan

Dr. Laurent Roy, Regina, has been appointed as a member of the Saskatchewan cancer commission. Appointment was made co-incident with the alteration of the status of Dr. F. C. Middleton, who becomes secretary of the commission. Formerly he held membership on the commission in addition to being secretary. Dr. Roy graduated from Laval University in 1905, practised for some years in Herbert, Saskatchewan, then took a two years' course in Paris. He has practised in Regina since 1913. In 1923 he studied the application of radium in cancer therapy for a month in New York.

On May 6th, Dr. R. G. Ferguson, director of Sanitoria for Saskatchewan, received a King's Jubilee Medal; on May 24th he was honoured by the Indians of the Muscowpetung, Pasqua and Piapot bands who named him their honorary chief in recognition for his work in fighting tuberculosis among the Indians in Saskatchewan. On June 3rd, Dr. Ferguson was in the list of those honoured on the King's birthday as the recipient of the Order of the British Empire. Dr. Ferguson persuaded the federal government to appoint a full-time medical man, Dr. A. B. Simes, to work among the Indians of the File Hills Reserve. The first year that this work was carried on the mortality rate among these Indians was cut in half. Dr. Ferguson was also influential in having provincial legislation passed providing free treatment for all cases of tuberculosis in Saskatchewan. The tuberculosis death rate in the province is 31.2 per 100,000 population, which is the lowest rate of any province in Canada.

LILLIAN A. CHASE

United States

The Julius Rosenwald Fund.—The trustees of the Julius Rosenwald Fund, at the annual meeting held in Chicago on March 19th appropriated $284,000 for the work of the year beginning July 1st. The appropriations were made for rural education, medical services, and negro welfare.

The Fund will maintain a staff of twelve teachers and students who will work with schools in the southern states in an effort to give education a more direct bearing upon life in rural communities. "During the recent industrial era," Mr. Embree, the President, said, "Schools have trained children almost entirely for success in the cities. Many present trends lead back to country life, and the schools must begin to fit children for life in the country and must cooperate with the health, agricultural and cultural agencies which are working to improve rural conditions."

It was announced that the Fund will continue its active interest in health insurance, pay clinics, public health, and other organized services which will make good medical care more available to people of small incomes. "Most striking among recent developments," said Dr. Michael M. Davis, Director of the Fund's medical division, "is the growth of plans initiated by physicians, hospitals or lay bodies, designed to improve the quality or reduce the costs of medical care, or to make it easier for average family to pay for it. To the office of this Fund alone there has recently come knowledge of 344 plans and projects in all parts of the country. Among these are projects for budgeting hospital bills at a cost of from $5 to $10 a year, which have been set under way in over 40 cities during the last two years, sponsored by the American Hospital Association, and endorsed in principle by the American College of Surgeons and recently by the editor of the *Journal of the American Medical Association*. The general public receives and pays for medical care. Physicians, dentists, nurses, hospitals and clinics furnish it. The public and the professions have a common interest in keeping up the quality of medical care and in working together on plans whereby the average family may get treatment without ruining its finances or asking for medical charity."

During the past year Dr. Davis served on the consulting staff of President Roosevelt's Committee on Economic Security, and Dr. C. Rufus Rorem, of the Fund's staff, served as consultant in group-hospitalization to the American Hospital Association.

The Chairman of the Board of Trustees of the Fund is Mr. Lessing J. Rosenwald; Mr. Edwin R. Embree is President. The other members of the Board of Trustees are: Dr. W. W. Alexander, Dr. John J. Coss, Robert M. Hutchins, Dr. Charles S. Johnson, Dr.

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Dr. Mallory Receives the Gold Headed Cane.—At the annual meeting of the American Association of Pathologists and Bacteriologists, April 17, it was voted to confer a gold headed cane on Dr. Frank Burr Mallory, Emeritus Professor of Pathology, Harvard Medical School, Boston. Before his death in 1922, Dr. Harold C. Ernst, who had for years been secretary of the association, turned over to it this cane to serve as a symbol of tribute by the Association to distinguished pathologists. According to Dr. Howard T. Karsner, of Cleveland, now secretary of the organization, the cane has been held by Drs. William H. Welch and Theobald Smith.

General

University of Toronto
Faculty of Medicine
Post-Graduate Course on Fractures

The University of Toronto, Faculty of Medicine, offers to graduates a course of one week, commencing Monday, September 23rd. This course will consist of lectures, demonstrations, clinics, operations and practical instruction on the cadaver. It will be conducted at the Toronto General Hospital, St. Michael's Hospital, the Hospital for Sick Children and the Banting Institute. The course will commence at 11 a.m. Monday, September 23rd, and will continue morning and afternoon, till Friday evening, September 27th.

The instructors will be as follows:—

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Colles's fracture.
Fractures of carpal scaphoid.
Fractures of mandible and other bones of face.
Fracture of the neck of the femur.
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The Course will be made as practical as possible, and an attempt will be made to have the students take part in all demonstrations.

Applications for admission to the course should be made to the Secretary, Faculty of Medicine, University of Toronto, before September 1st.

A fee of $25.00 will be charged.

Book Reviews

Textbook of Medical Psychology. Ernst Kretschmer, Dr. Med., Professor of Neurology and Psychiatry, University of Marburg. Tr. by E. B. Strauss, M.A., D.M., M.R.C.P., Assistant Physician to Cassel Hospital for Functional Nervous Disorders. 274 pages. Price $4.50. Oxford University Press, London; McAinsh & Co., Toronto, 1934.

In this translation we are presented with the author's contribution to medical science, in which he stresses mental mechanisms and reactions in the light of observations derived from anatomy, physiology, neurology, biochemistry, psychiatry and related studies. He has not created a new school, but has allowed a wide scope for interpretation of phenomena and urges that medical psychology be considered not as a side-line but as part of "medicine itself". The purpose of retaining that close correlation will thus be attained and students will not remain in ignorance of human psychology and psychopathology, and will be able to more clearly understand the principles underlying normal and abnormal behaviour.

In the early chapters the author deals with the chief psychic functions and their anatomical and physiological basis. The early chapters will not be found easy reading for anyone except the expert, but contain interesting problems and stimulus for thought. The chapters dealing with instincts and temperaments and those dealing with personality types will be found most interesting and instructive to all those who are dealing with problems of human behaviour. The author has completed his work with a section on practical medical psychology including medico-legal aspects. The chapter on psychotherapy is particularly practical, and will be well appreciated by the general practitioner. He has given here in a concise and comprehensive manner a guide to successful analytical psychotherapy.

The reader, if not an expert, may find the early chapters difficult, but the book is well balanced by the appeal of the more practical chapters to the student and should realize the hope of the translator that it will help to modify the approach to more successful general medicine.

The Biochemistry of the Eye. Arlington C. Krause, M.A., Ph.D., M.D., F.A.I.C., Instructor in Ophthalmology, Johns Hopkins Medical School, etc. xv and 264 pages; price, $3,25; Johns Hopkins Press, Baltimore, and Oxford University Press, London; 1934.

This book is indeed an "eye-opener". Those of an older day, who are possibly inclined to look upon the eye specialist as a superior kind of artizan, will here find ample grounds for a revision of that belief. The amount of research work that has been done in the subject of ophthalmology within the past twenty-five or thirty years is positively amazing. Doctor Krause's book brings to our notice in an effective way all that is of value in this particular field, and with some attempt at critical analysis. The author fully recognizes that the last word has not been said, but, at the same time, indicates along what lines farther advance may be expected. What we think of as "scientific medicine" is now largely a matter of bio-chemistry and bio-physics. The same may be postulated of ophthalmology. The book takes up systematically the chemistry of the various tissues and component parts of the eye and its adnexa, the data being correlated with the teachings of anatomy, physiology, pathology, immunology, and, to some extent, with clinical observations. Ocular pathology and ophthalmological practice may be greatly advanced by a knowledge of the chemistry of the eye, and other contacts will be established as our knowledge increases. Among the

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important subjects discussed by Doctor Krause are the permeability of the ocular tissues, the metabolism of the retina, the growth of the eye, the senescence of the lens, the nature of the ocular pigments, Donnan's equilibrium theory, the pathology of the vitreous humour, and the etiology of cataract.

The book will prove somewhat heavy reading for the general man, but is indispensable for the progressive ophthalmologist, the physiologist, the biochemist and the pathologist. There are nearly one thousand references. We predict that for long Krause's "Biochemistry of the Eye" will be the last word on the subject.

Injuries and Their Treatment. W. Eldon Tucker, M.D., B.Ch., F.R.C.S., Surgeon to St. John's Hospital, Lewisham. 174 pages, illustrated. Price 9s. net. H. K. Lewis Co., London, 1935.

This small volume is from the pen of a surgeon who has devoted his attention to the newer physiotherapeutic and manipulative measures in the treatment of injuries. There is a foreword by Sir Humphry Rolleston. In this he states that "the text of this book is the judicious use of exercise and manipulations in injuries". The injuries which the author describes, are of the soft tissues, and the pathology and rationale of treatment are briefly, though succinctly, outlined. The two main sections are devoted to chapters on "on methods prescribed" and the diagnosis and treatment of injuries. Contained in the former are the methods of treatment which in his experience have proved most successful. In the latter are discussed injuries of muscles, tendons, joints, nerves, bruising of bone, and injuries to bursæ. Where necessary, the author strictly adheres to the reasoned judgment of the surgeon in expressing his opinion. The experienced physician or surgeon is well aware how difficult it is to obtain beneficial results in treating many of the injuries described in this excellent treatise. Therein he will find much to encourage him.

Handbook of Anæsthetics. J. Stuart Ross, M.B., Ch.B., F.R.C.S.E., Late Lecturer in Practical Anæsthetics, University of Edinburgh, and H. P. Fairlie, M.D., Anæsthetist to the Western Infirmary, etc. Fourth edition, 292 pages, illustrated. Price $3.00. E. & S. Livingstone, Edinburgh; Macmillan Co., Toronto, 1935.

This comprehensive little volume contrives to cover the diversified field of modern anæsthesia and succeeds to no small degree. The chapters devoted to the theory of narcosis and shock are particularly instructive, and special mention must be made of the clear presentation of Crile's method of anoci-association. A new chapter on basal narcotics has been added, which discusses the use of avertin, paraldehyde, nembutal and sodium evipan. The authors wisely insist that avertin should be regarded as a basal anæsthetic and that it is unsafe to administer it in doses sufficient to produce full anæsthesia.

Anæsthetists on this side of the Atlantic will doubtless find much of the apparatus illustrated to be unfamiliar, but as the underlying principles are the same and the accompanying descriptions are so clear, much benefit may be derived from a comparison with their own particular methods and apparatus. One could wish for a more complete treatment of the "closed method" of administering anæsthetics, involving the absorption of carbon dioxide from the expirations of the patient.

The chapter on spinal anæsthesia includes the technique of administering percaine (nupercaine), an anæsthetic solution which has come into wide favour since the last edition of the book and bids fair to replace the other commonly used drugs for this purpose. The description of sacral anæsthesia has been omitted from this edition, as the authors feel that a low spinal anæsthetic is easier to carry out, safer, and more certain in its action.

The book may be recommended as admirably suited to the requirements of the undergraduate and general practitioner who desire to obtain a working knowledge of modern anæsthetics and their administration.

Medical Tactics and Logistics. Col. Gustavus M. Blech, Medical Reserve Corps, U.S. Army, and Col. C. Lynch, Medical Corps, U.S. Army, Ret. 205 pages. Price $4.00. C. C. Thomas, Springfield and Baltimore, 1934.

"Logistics" is defined as "The Art and Science of War which comprises everything relating to the movement and supply of troops". The book is intended primarily to enlist the consideration of medical practitioners in the United States in problems of national defence. The Medical Service is shown to be an essential component of a modern army. Its methods are explained so that friction in time of necessity may be reduced to a minimum. The medical arrangements for an infantry force are studied in detail and one chapter is devoted to the Medical Service with cavalry. The subject is dealt with in narrative style throughout and is very readable. The authors assess accurately the medical requirements of a military body and how the Medical Service meets them. Their tactics are interesting and apparently sound. Even a cursory reading gives food for thought.

The book can be recommended to any medical practitioner desirous of learning something of military medicine as being easy to read and instructive. To those medical officers who want a text on tactics it will prove useful only if they are prepared to study the whole United States medical corps organization and re-orient their conception of army medical corps administration from that basis.

The Technique of Post-Mortem Examination. D. R. Coman, M.D., C.M., Assistant to the Institute and Demonstrator in Pathological Anatomy, McGill University. 47 pages, 12 illustrations. Price $1.40. Renouf Publishing Co., Montreal, 1934.

There has long been a definite need for a concise text-book on autopsy technique, written in English. In this small volume Dr. Coman has filled the deficiency in a very able manner. His descriptions and explanations are clear and well organized. He carries one in an orderly fashion through the various techniques used in post-mortem examination, following as much as possible, with a few modifications, the continental procedures. The illustrations are semi-diagrammatic, well executed, and properly placed with regard to the text. The only criticism that one would make is on the absence of an index and the author's economy in the use of the definite and indefinite articles — one of the effects of the daily newspaper, no doubt. But these are small matters when one considers the general merit of the book. Every medical student, and even the practitioner, would do well to have it in his possession.

Some Notable Epidemics. H. Harold Scott, M.D., F.R.C.P., D.P.H., D.T.M. and H., F.R.S.E., Assistant Director, Bureau of Hygiene and Tropical Diseases. 272 pages. Price $3.75. Edward Arnold & Co., London; Macmillan Co., Toronto, 1934.

One of the most important duties of a medical officer of health is to be prepared to act promptly and efficiently when faced by an epidemic of disease. The author presents in this volume his study of a number of British epidemics, their extent, method of management and the investigations undertaken to trace and control their sources. It has entailed extensive research and the reading of reports and studies not readily available. He has succeeded in placing before the student of epidemiology a valuable contribution to the literature of epidemics, principally milk-borne and water-borne, with some due to food

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The Construction of Modern Hospitals and Their Equipment. 676 pages, illustrated. Price Swiss Frs. 40. Edited and published by M. Schaerer, S.A., Berne (Switzerland), 1935.

This profusely illustrated volume is a valuable addition to the hospital literature on hospital construction and equipment. Although edited under the auspices of a well-known continental surgical supply house, it is in no sense a trade publication, as the editors have obtained the collaboration of a number of leading clinicians and others, and have prepared a most comprehensive volume dealing with such varied subjects as general problems of planning and construction, the designing of operating rooms, including lighting, the sterilization of supplies, covering equipment and technique, the arrangement of wards, incubator rooms and many other features. A special section of the book deals with the construction and arrangement of sanatoria, such as those at Arosa, Leysin, Agra and Berck-sur-Mer. It is really a review of the outstanding features of many of the leading hospitals and sanatoria of Europe for the authors have drawn widely upon these institutions for illustrations and data to complete the text.

From the viewpoint of a Canadian reader there are certain features which might not be particularly applicable to our customs here, for instance, in the designing of elevator lifts or the arrangement of certain services, but the work is particularly refreshing, because it brings to our attention procedures which have been developed to a very high degree on the continent. For instance, the use of under-floor or wall-panel heating is considered, a form of heating which has not, as yet, received much consideration in this country. The text describes also, *inter alia*, ambulance aeroplanes, ambulance coaches for railways, and the housing of experimental animals. Many of the newer hospitals illustrated are designed in the modern continental style, which, by the use of reinforced concrete, steel and glass, permits the construction of unusually well illuminated buildings with striking and extensive verandah space. The introduction to the work was written by Prof. F. de Quervain, Director of the Surgical Clinic of the Bernese University.

Voluntary Sterilization. C. B. Blacker, M.C., M.A., M.D., M.R.C.P., General Secretary of the Eugenics Society. 145 pages, with diagrams. Price $1.50. Oxford University Press, London; McAinsh & Co., Toronto, 1935.

This is a very satisfactory publication. Beginning with a review of the history of sterilization in England, which brings out in sequence the findings of the various committees appointed to study the subject, the author presents certain legal opinions on the present legality of voluntary sterilization. This is followed by a very fair and temperate consideration of what sterilization might accomplish in the elimination of hereditary defects and diseases. Attention is directed particularly to "The Social Problem Groups", subnormal groups who exhibit multiple social problems and who, although not mentally defective in a legal sense, are probably carriers of defect. The objections to sterilization and the arguments against compulsory measures are well presented. Anyone who is interested in the subject and desires to learn something about it will welcome this very clear, readable and fair presentation.

What of the Child? Andrew Kefalas, M.A., M.B., Ch.B. 187 pages. Price $1.50. Wm. Heinemann, London; Macmillan Co., Toronto, 1934.

"What of the Child?" is a worth-while book because it expresses the author's opinions, based upon his own practical experience in a field of work for which he has qualified. The book deals with such training and instruction of the child as leads to mental health. It is a plain statement, and, as would be expected, subjects are discussed about which there is a difference of opinion. The book is a valuable addition to the literature, and should be helpful to the intelligent lay public.

Hygiene for Freshmen. Alfred Worcester, A.M., M.D., Sc.D., Henry K. Oliver, Professor of Hygiene, Harvard University. 151 pages. Price $1.50. Charles C. Thomas, Springfield and Baltimore, 1934.

A series of lectures on the subject of hygiene is offered to Harvard freshmen. This book of twelve chapters gives the substance of the lectures, and is published "to save the students' attention from the distraction of notetaking." Used in this manner, the publication may justify itself, but, read alone, it seems to be a rather drab presentation of the subject for an age-group who are not interested in it, as most of them enjoy good health.

A Textbook of Nursing Technique. Marion L. Vannier, R.N., and Barbara A. Thompson, R.N., B.S. Second edition, revised. 265 pages, illustrated. Price $2.50. University of Minnesota Press, Minneapolis, 1935.

This manual of nursing procedures was prepared originally for the use of students in the University of Minnesota School of Nursing. The primary purpose of the manual was to assure accuracy in detail and to obviate the necessity of note-taking by the students during the demonstrations. It is a very comprehensive little volume covering the technique of all of the routine nursing duties, and also many advanced procedures, such as eye, ear, nose and throat treatments, the preparation of a patient for operation, catheterization, gastric irrigations, and procedures in the handling of patients suffering from communicable diseases. It is an exceedingly practical little volume, and should make a welcome addition to the library of any nurse.

The B.C.G. Vaccine. K. N. Irvine, D.M., M.A., B.Ch., M.R.C.S., L.R.C.P., Honorary Physician to Henley War Memorial Hospital. 70 pages. Price $1.50. Oxford University Press, London; McAinsh & Co., Toronto, 1934.

A capital summary of the work done on this subject. It is difficult to get such condensed and comprehensive accounts of what is being done with BCG. This one is highly recommended to those wishing to know what is being done on the subject.

Nature's Way. Victor C. Peddersen, A.M., M.D., F.A.C.S. 81 pages. Price $1.00. G. P. Putnam's Sons, New York, 1934.

A clear review of the evidence in favour of the view that definite fertile and infertile periods occur in a woman's menstrual cycle.

BOOKS RECEIVED

Disease, Gadfly of the Mind. W. A. Pusey, A.M., M.D., LL.D. Prosser-White Oration before the St. John's Hospital Dermatological Society, Royal Society of Medicine. 20 pages. H. K. Lewis, London, 1934.

Das Extremitäten-, Thorax- und Partial- Elektrokardiogramm des Menschen. Franz M. Groedel, Director of Wm. G. Kerchhoff-Herzforschungs Institute, Bad-Nauheim. Vol. 1, 358 pages, illustrated. Vol. 2, 200 plates. Price RM 25. Theodor Steinkopff, Dresden and Leipzig, 1934.

Elementary Human Anatomy Based on Laboratory Studies. Katharine Sibley, Prof. of Physical Education, Syracuse University, N.Y. 360 pages, illustrated. Price $4.40. A. S. Barnes & Co., New York, 1935.